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Actionee: N/A
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TSD: D-1-2
ERA: N/A
Subject Code: 9800, 8280

May 9, 2001

100NTSD-SC-100

Foster Wheeler Environmental Corporation
Mr. R. Dale Carruth, Project Manager
3200 George Washington Way, Suite G
Richland, Washington 99352

Subject: **SSI FOR SHIPPING TROUGH SECTIONS (REV 1)**
SUBCONTRACT NO. 0100N-SC-G0058
HANFORD ENVIRONMENTAL RESTORATION PROJECT
100-NR-1 TSD SITES REMEDIAL ACTION PROJECT

Reference: BHI Letter: 100NTSD-SC-065 (CCN 085186)

Dear Mr. Carruth:

The attached revised Site Specific Instruction for "*Shipping Trough Sections Using Flexible Material Packaging Revision 1*"is issued to Foster Wheeler Environmental Corporation (FWENC) for your use.

At this time, FWENC shall remobilize the crane to support and continue the 116-N-3 crib trough removal.

Should you have any questions regarding this matter, feel free to contact me at 373-6894.

Sincerely,

Ernie K. Mokuiki
Subcontract Technical Representative

EKM:jll

BECHTEL HANFORD, INC.
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SITE-SPECIFIC INSTRUCTION

FOR

SHIPPING TROUGH SECTIONS USING FLEXIBLE MATERIAL PACKAGING

100-NR-1 OPERABLE UNIT
HANFORD SITE
RICHLAND, WASHINGTON

1	May 7, 2001	T. M. Routt	J. D. Fancher	E. L. Adamson	J. M. Atwood	R. L. Donahoe
0	October 20, 2000	L. E. Ivey	J. D. Fancher	E. L. Adamson	J. M. Atwood	R. L. Donahoe
REV.	**DATE**	**ORIGINATOR**	**REVIEWER**	**QA**	**TRANSPORTATION MANAGER**	**TASK LEAD**

SITE-SPECIFIC INSTRUCTION FOR SHIPPING TROUGH SECTIONS USING FLEXIBLE MATERIAL PACKAGING

CONTENTS

1.0 PURPOSE

The purpose of this site-specific instruction (SSI) is to assist the project in the implementation of BHI-EE-10, *Waste Management Plan*, Section 4.0, "Waste Shipping and Documentation," and BHI-EE-12, *ERC Transportation Manual*, Section 3.0, "Packaging Hazardous Materials for Transportation," and to define the specific requirements for shipment of oversized objects using flexible materials for packaging associated with the 100 NR–1 Remedial Action excavation.

2.0 REGULATORY BASIS

Remediation of the 100-NR-1 radioactive waste sites (116-N-1, 116-N-3, and UPR-100-N-31) will remove low-level radioactive waste that will be disposed in the Environmental Restoration Waste Disposal Facility (ERDF). Certain trough sections that cannot fit into standard ERDF roll-on/roll-off containers will be packaged using flexible material packaging. Packaging and shipment of the waste must meet the Safety Analysis Report for Packaging specifications as approved.

Regulations that may apply to the transportation of these trough sections can be found in the following federal and state regulations: 40 *Code of Federal Regulations* (CFR), *Washington Administrative Code* (WAC) 173-303, the Revised Code of Washington [RCW] Title 46, *Motor Vehicles*, and in DOT 49 CFR. Additionally, DOE Order 1540.1, *Materials Transportation and Traffic Management*, establishes the policies and procedures governing transportation activities. Administrative procedures to certify and use radioactive and other hazardous materials packaging are identified in DOE Order 1540.2 C-1, *Hazardous Material Packaging for Transport-Administrative Procedures.* Safety requirements to package and transport hazardous materials, substances, and waste are mandated in DOE Order 5480.3. BHI-EE-12, Section 3.0, "Packaging Hazardous Materials for Transportation," contains implementing procedures for packaging all onsite shipments of regulated materials.

Duratek Federal Services of Hanford, Inc. has prepared an evaluation of the shielding, structural, thermal, containment, risk, dose consequence, limits on radioactive isotopes, and tiedown systems (Duratek 2001). This evaluation has been incorporated into the *Safety Analysis Report for Packaging (Onsite) Flexible Material Packaging* (FH 2000) with a Design Package (DP) (BHI 2001b) and is based on the use of a 200-ton low-boy trailer as the transfer vehicle. The DP was prepared in accordance with BHI-MA-02, Procedure 6.2.

3.0 HAZARD CATEGORIZATION

The hazard categorization for this activity is based on the *116-N-3 Main Trough Activities and Hazard Classification* (BHI 2001a). The calculation is a comparison of the maximum inventory

of radionuclides on a 27-ft section of the main trough with the DOE-STD-1027-92 Category 3 Threshold Quantities (DOE 1992). This comparison shows that the maximum radionuclide inventory is less than the Category 3 threshold (i.e., the sum of the threshold quantity fractions for the individual isotopes is less than one). Shipments of trough sections 27 ft long or less are classified as below a Category 3 nuclear facility; therefore, the provisions of 10 CFR 830, Subpart B, do not apply to this activity.

3.1 DESCRIPTION

The flexible material packaging is used for the onsite transfer of trough sections to the designated disposal facility. The flexible material packaging is authorized when use of other packaging cannot be considered operationally practical and/or cannot be economically justified. The package consists of two or more layers of flexible material (4-mil minimum thickness for each layer) wrapped and sealed around the radioactively contaminated item. Dimensions and configuration of the flexible material packaging will vary based on the item(s) to be wrapped. Padding of sharp edges and corners of the item is done to prevent puncture or stressing of the flexible material packaging. Closure of the layers of flexible material used to wrap the item is accomplished by either taping with reinforced cotton cloth tape or approved equivalent, or heat sealing. The package is loaded onto a truck-trailer combination and transferred to the designated storage or disposal area.

4.0 REQUIREMENTS

4.1 MATERIALS REQUIREMENTS

4.1.1 Packaging

The flexible materials authorized for flexible material packaging usage are PERMALON X100 FR, GRIFFOLYN T-55 TR, LORETEX 2000/2000 FR-6, LORETEX 3000/3000 FR-7, and vinyl laminated cloth meeting military specification MIL-C-43006G, Types I and II, Class 1. The flexible material shall meet the vendor's specifications, which includes a 4-mil minimum thickness for each layer.

4.1.2 Tiedown Devices

Tiedown Assemblies. The aggregate working strength of the tiedown assemblies (e.g., chains, straps) used to secure the flexible material packaging against movement in any direction must be at least one-half times the weight of the flexible material packaging (49 CFR 393.100). Chain used as a component of a tiedown assembly must conform as a minimum to the requirements of the June 15, 1990 edition of the National Chain Manufacturers' Welded Steel Chain Specifications, applicable to all types of chain.

Load binders and hardware. The strength of the load binders and hardware that are part of, or used in conjunction with, the tiedown assembly must be equal to, or greater than, the minimum strength specified for the tiedown assembly.

Attachments to the vehicle. The hook, bolt, weld, or other connector by which the tiedown assembly is attached to the vehicle, and the mounting place and means of mounting the connector, must be at least as strong as the tiedown assembly when that connector is loaded in any direction in which the tiedown assembly may load it.

Winches or other fastenings. The anchorages of a winch or other fastening device mounted on a vehicle and used in conjunction with the tiedown assembly must have a combined tensile strength equal to, or greater than, the strength of the tiedown assembly.

Adjustability. The tiedown assembly and its associated connectors and attachment devices must be designed, constructed, and maintained so that the driver of the vehicle can tighten them.

Fabricated objects. All tiedown devices and bracing (including lateral restraints) fabricated for use according to this SSI shall be made using the appropriate weld rod for the base material as specified by the American Welding Society (AWS) and will be visually inspected by an AWS certified inspector.

4.1.3 Blocking and Bracing Components

Protection against longitudinal movement. The flexible material packaging must be secured so that, when the vehicle decelerates at a rate of 20 ft/s/s, the flexible material packaging will remain on the vehicle and will not penetrate the vehicle's front-end structure.

Protection against lateral movement. The flexible material packaging must either be securely blocked or braced against the sideboards, or staked and secured by a tiedown assembly.

Blocking and bracing components. Components used for blocking and bracing must have an aggregate working strength of at least one-half times the weight of the flexible material packaging. Blocking and bracing using wood must be constructed from the following species of wood: red or white oak; white ash; yellow or sweet birch; American or slippery elm, hickory; hard, sugar, or black maple; sweetgum; black cherry; and southern pine; western pine; and fir. All wood needs to be straight-grained and free of decay and strength-impairing knots. Nail holes shall be predrilled. Nails that hold the chocking and blocking to the decking shall be driven at right angles to the decking and staggered 2 in. apart. At a minimum, wood chocking and blocking shall be constructed from 2 x 4 dimensional grade lumber. As a minimum, 10 d double headed, staging nails shall be used.

4.2 CONTENT REQUIREMENTS

4.2.1 Radiological Requirements

The radionuclide inventory on the transfer vehicle shall be up through and including Type B, shall be fissile excepted per 49 CFR 173.453, shall be nontransuranic (<100 nCi/g of Tru nuclides waste matrix) per DOE Manual 435.1-1, and shall be less than a Highway Route Controlled Quantity per 49 CFR 173.403.

4.2.2 Radioactive Concrete Sections

Radioactive concrete sections refer to trough sections removed from the 116-N-3 Crib that will not be shipped inside an ERDF container.

4.3 TRANSPORTATION REQUIREMENTS

Environmental. Transfer shall not take place at temperatures below -17.8 °C (0 °F) or when wind speed exceeds 15 mph. The maximum surface temperature of the wrapped item shall not exceed the temperature ranges stated by the flexible material packaging manufacturer. Per the discretion of the Bechtel Hanford, Inc. (BHI) waste shipper, visibility impairment caused by fog, rain, snow, or dust may hold transfer.

Radiation limitations. The radiation level on the external surface of the flexible material packaging shall not exceed 200 mrem/h, except one side and bottom may have "hot spots" up to 1,000 mrem/h. "Hot spots" may be identified with labeling and marking showing radiation level. The radiation level at 2 m shall not exceed 10 mrem/h. The dose rate to the driver shall not exceed 2 mrem/h. Shielding may be provided on the transfer vehicle to reduce the exposure level to the driver.

Contamination Limitations. Removable contamination on the external surfaces of the flexible material shall be checked to ensure the following limits are not exceeded: 1,000 dpm/100 cm^2 for beta/gamma-emitting isotopes, and 20 dpm/100 cm^2 for alpha-emitting isotopes.

Routing. The transfer route shall be controlled to preclude public access during the transfer.

Exclusive use. The transfer vehicle shall be exclusive use and shall not carry any other package containing hazardous material during flexible material packaging transfer. Direction regarding route of travel and speed considerations shall also be provided.

Vehicle bed size. The transfer vehicle shall be an 11-ft, 9-in.-wide 200-ton low-boy trailer, provided by Neil F. Lampson, Inc. of Kennewick, Washington. The trough sections may be supported without any additional support under the extending weir boxes (Obenauer 2001).

5.0 INSPECTIONS

5.1 PRE-USE INSPECTIONS

Pre-use inspections shall be performed before each use of the flexible material packaging. Inspections to be completed, prior to each use, include the following:

1. BHI shippers and Foster Wheeler Environmental Corporation (FWEC) shall ensure that the packaging described in Section 4.1.1 meets requirements of this SSI. The flexible materials used for the package shall be in unimpaired condition (no tears, no punctures, or stretched areas, and has not been subjected to adverse environmental conditions).

2. BHI shippers and FWEC shall visually inspect the item to be packaged to identify and correct protrusions or other conditions that could adversely affect the, structural integrity, packaging, or tiedown.

3. FWEC shall ensure that the tie-down equipment meets specification and acceptance criteria.

4. FWEC shall ensure that the blocking meets specification and acceptance criteria.

5. FWEC shall ensure that the bracing plate meets specification and acceptance criteria.

5.2 PRE-LOADING INSPECTIONS

1. If the trough is packaged before it is loaded, then, after packaging, RadCon shall inspect the flexible material packaging to verify it maintains containment.

2. If the trough is packaged before it is loaded, then, after packaging, the BHI shipper shall verify that the package is properly sealed.

3. The trailer deck, wood timbers, mat, and bottom of the package shall be inspected to ensure that they are clean, dry, and free of any debris or surface oil.

5.3 PRE-SHIPMENT INSPECTIONS

1. The BHI shipper and FWEC shall inspect the load to ensure that there is no evidence of tears, breaching, cracking, oxidation, embrittlement, leakage, or other effects encountered during loading, from adverse weather conditions, or from chemical reactions.

2. The BHI shipper and FWEC will inspection the dunage, cribbing, mats, chains, and bracing to ensure that they are properly placed.

3. The BHI shipper and FWEC will independently verify that each flexible material packaging layer is properly sealed.

4. A minimum amount of space should be left between the flexible material and the surface of the trough sections

5. The BHI shipper and FWEC will independently verify that the flexible material packaging is properly tied down.

6. The BHI shipper shall ensure that tiedowns are taut but do not affect the flexible material packaging or have the potential to tear the flexible material packaging during transport.

7. The BHI shipper will ensure that the packages are conspicuously and durably marked as required by DOT and that shipping papers are properly completed.

8. BHI RadCon will document contamination levels and external dose rates.

9. The BHI shipper and FWEC shall ensure that the item is properly wrapped with flexible material.

10. The BHI shipper shall inspect the flexible material packaging for signs of deterioration, puncturing, breaching, or damage.

11. The load shall be inspected thoroughly by the shipper and carrier prior to release of the shipment. The shipper should ensure that the carrier recognizes his or her responsibility to check the tiedowns at least once during transit, and tighten them as necessary.

6.0 OPERATING PROCEDURES

6.1 TIEDOWN SYSTEM

The analysis for the BHI tiedown system assumes a worst-case package that is rectangular with a length of 27 ft, a width of 13 ft, and a weight of 110,000 lb. In accordance with the current regulations stated in 49 CFR 393.100, the tiedown system must be sized for a working load limit (WLL) of 0.5 times the gross weight of the package, or in this case, a maximum of 55,000 lb. The conveyance in this case shall be an 11- ft-wide, 200-ton low-boy trailer. The trailer shall be equipped with eight (8) Spectrum 8, 3/8-in. chains with a WLL of 7,100 lb. The load will be secured vertically by box sections constructed of two (2) C12 x 30 welded together placed over the load and secured to the trailer D-rings by chain and fittings. Each of the D-rings shall have a WLL of 15,600 lb. Chains and tie down assemblies shall be tagged with the working load limit or documentation of certification shall be provided to BHI.

The configuration of the trough tiedowns are shown in Figures 1 through 4. The following are the requirements for the tiedown of the package. To hold the package in the vertical direction, the four D-rings toward the front of the trailer shall be used. There shall be two 3/8-in. chains (with a WLL of 7,100 lb each) in each of the second and third D-rings as shown on Figures 1 and 2. A block of wood or a rubber bumper shall be placed between each chain and the package to prevent the possibility of damage to the flexible material wrapping. Figures 3 and 4 show the tie-down configuration for short trough sections on a 65-ton low-boy trailer. This configuration is the same for the 200-ton low boy trailer.

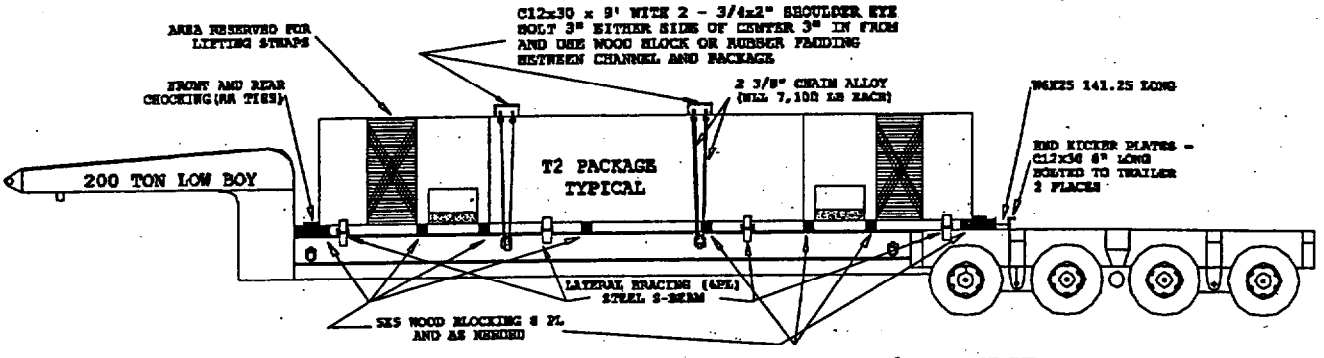
For blocking and bracing in the lateral direction, a 6x17.25 S beam, 12 ft long with a 6 x 4 x ½ in angle welded to the web on each end and two (2) 6 x 4 x ½ angles welded to the web 4 ft, 3 in on either side of the beam center will be used. Over the wheels, a 6 x 17.25 S beam, 8 ft, 6 in. long with a 6 x 4 x ½ in. angle welded to each end and welded 9 ¾ in. in from the ends with a span of 6 ft, 10 ½ in. face to face will be used. The load will be secured for axial movement by blocking and bracing at the front of the load to the trailer's structural vertical beams and at the rear of the load by either kicker plates, an end brace yoke, or by restraining the load with chains that attach to D-rings on the opposite sides of the trailer. For the 27-ft load, two C12 x 30 channels will be bolted to existing holes in the trailer (Figure 6]), between the kicker plates a W6 x 25 beam, 141.25-in.-long will be placed. For shorter loads, an end brace yoke S-10 x 24.4 beam with ½-in. steel plate sides welded (1/4-in. filet welds) will be used to allow pinning to the trailer (Figure 7). All metal shall be A36 carbon steel.

In total, there will be four beams, which will be braced on each side against the package with wood blocks. The S beam will be blocked in the fore and aft directions by 2x4 chock blocks manufactured from commercial grade lumber nailed to the deck of the conveyance to prevent shifting of the beams. In addition, wood shall be placed between the S beam and the package on the underside to protect the package wrapping. Shims shall be used as necessary between the S beam and deck of the trailer, such that the S beam fits tightly to the trailer deck. The package will be set on 5x5 timbers in sufficient number to support the load without crushing of the timbers or damaging of the package. Refer to Figures 5 through 7 for additional details.

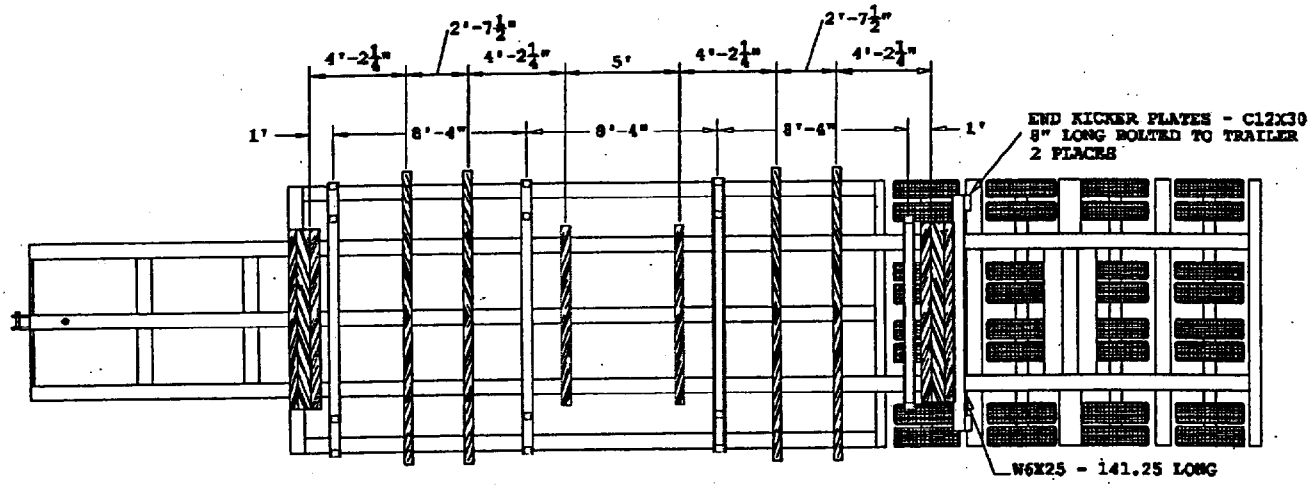
The package shall be placed on a commercial load mat, or at a minimum, a 0.64-cm (1/4-in.) rubber load pad. The mat or pad shall be placed between the bottom of the package and the timbers. Additionally, another mat or pad shall be placed between the timbers and the deck of the trailer. These mats or pads are used to increase the friction between the package and timbers and timbers and trailer deck. Consequently, the trailer deck, wood timbers, mat, and bottom of the package shall be clean, dry, and free of any debris or surface oil.

If the bottom of a trough section is rough or uneven, 1-in.-thick rigid insulation should be placed between the package and any bracing or blocking to prevent damage to the package wrapping.

Figure 1. Side and Top Views of BHI Tiedown for Worst Case (T2) Packages.

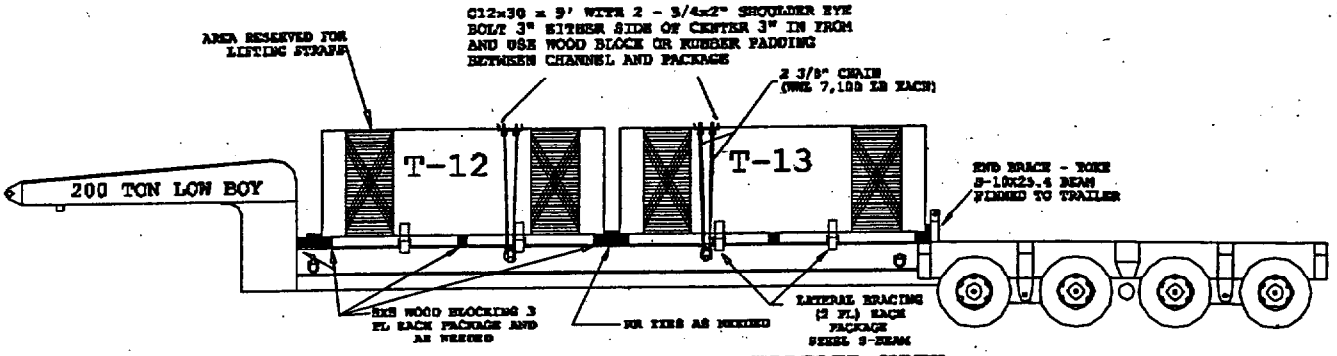


200 TON LOWBOY TRAILER WITH T2 PACKAGE
(SIDE VIEW)

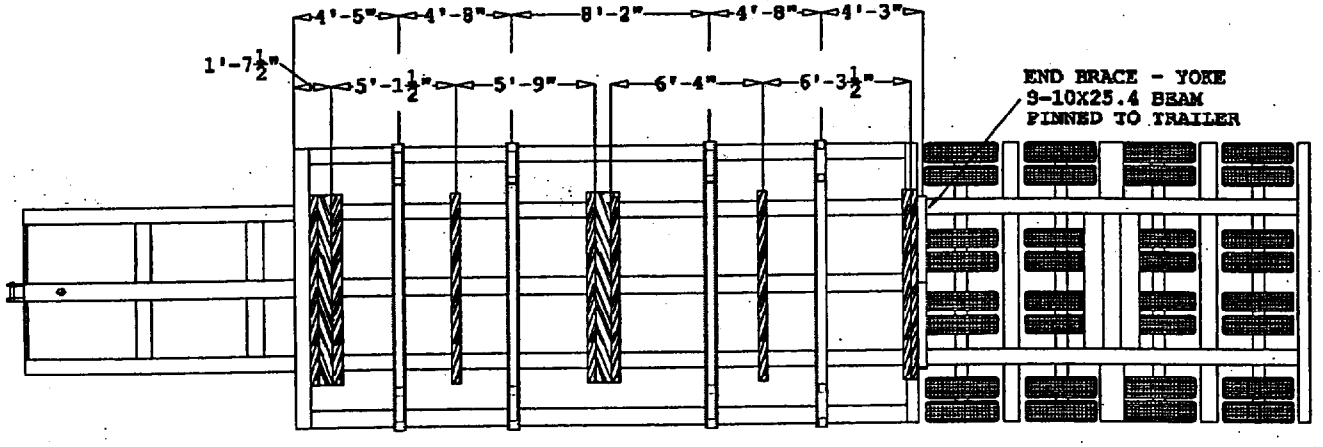


200 TON LOWBOY TRAILER WITH T2 PACKAGE
(TOP VIEW)

Figure 2. Side and Top Views of BHI Tiedown for T12 and T-13 Packages.

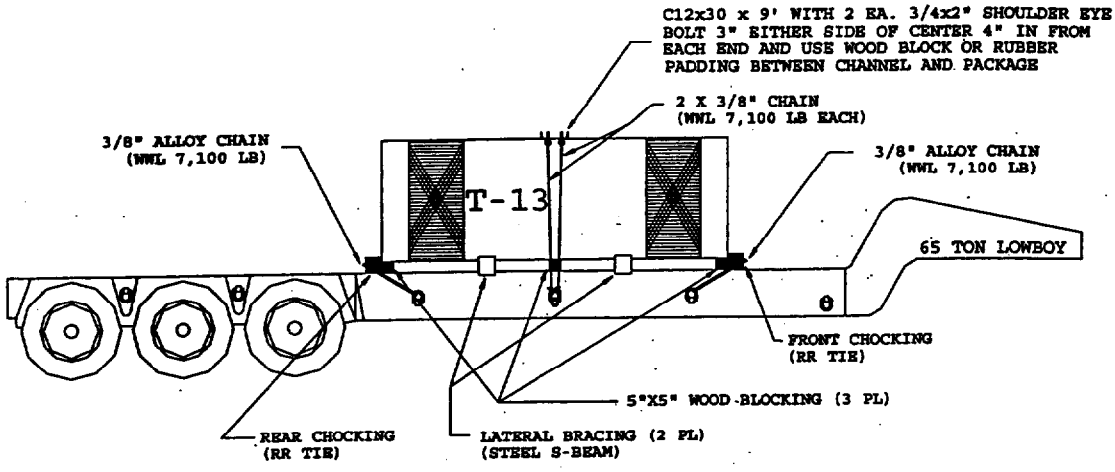


200 TON LOW BOY TRAILER WITH
T12 & T13 PACKAGES (SIDE VIEW)

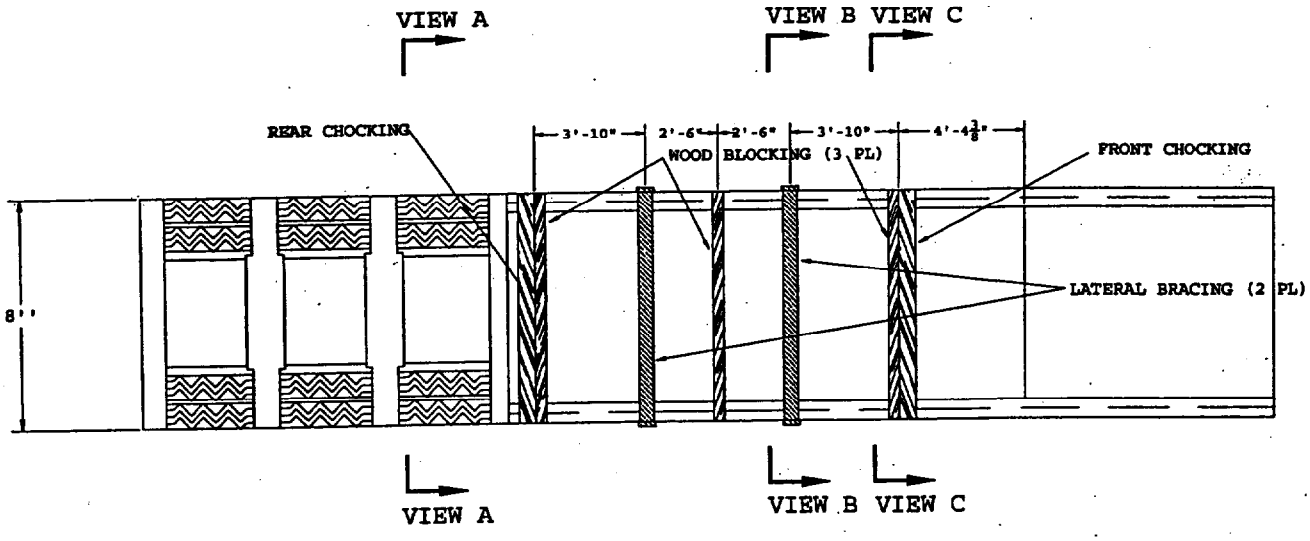


200 TON LOW BOY TRAILER WITH
T12 & T13 PACKAGES (TOP VIEW)

Figure 3. 65 Ton Lowboy with T13 Tiedowns (Identical for 200-Ton).

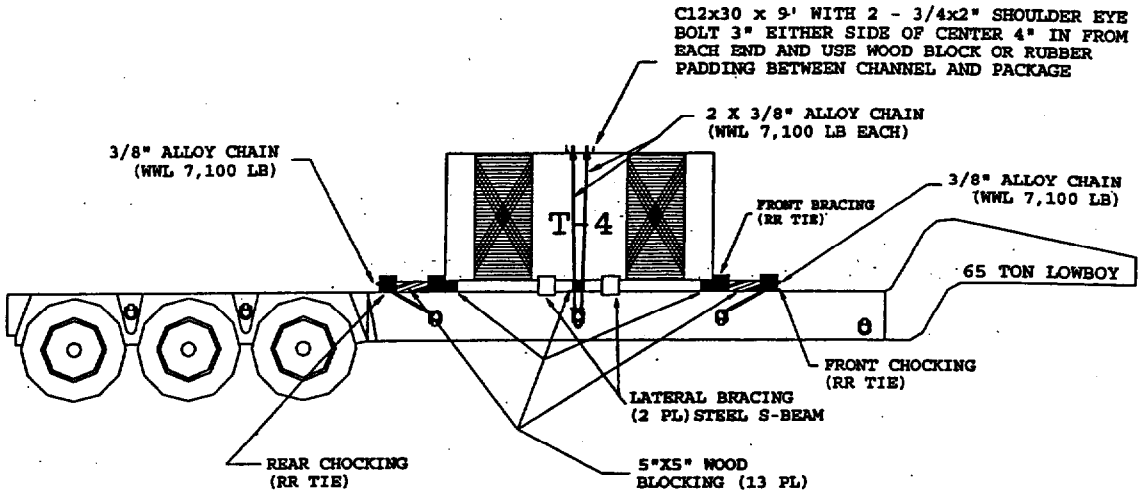


65 TON LOWBOY WITH T13
SIDE VIEW (TIEDOWNS)

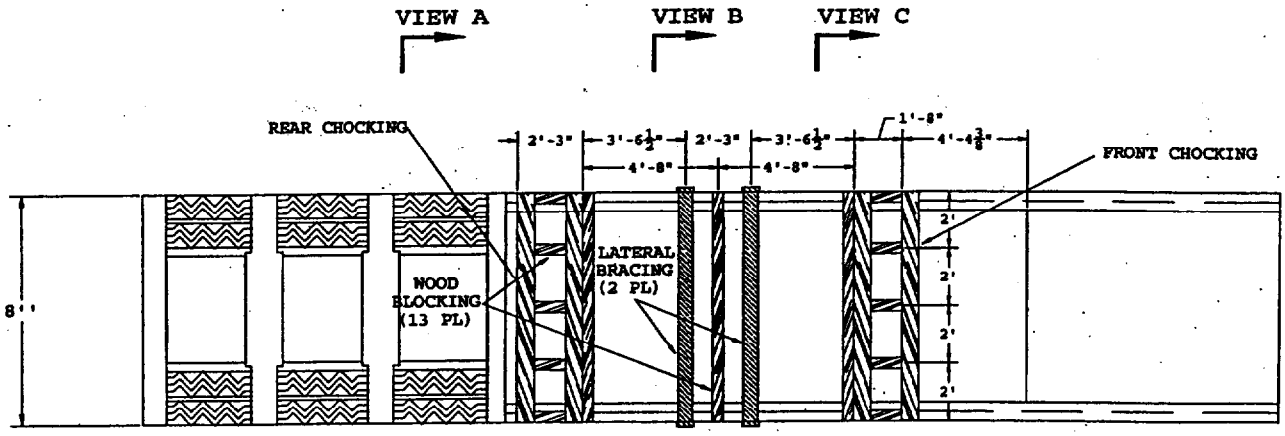


TOP VIEW (BLOCKING)
FOR T13 PACKAGE
DIMENSIONS ARE APPROXIMATE

Figure 4. 65 Ton Lowboy with T4 Tiedowns (Identical for 200-Ton).

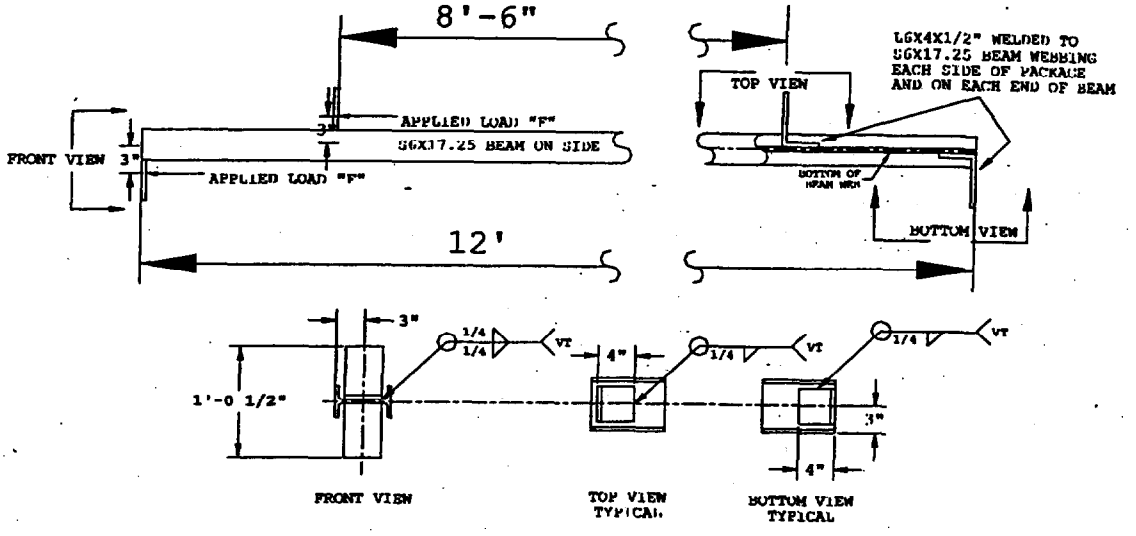


65 TON LOWBOY WITH T-4 PACKAGE
SIDE VIEW (TIEDOWNS)

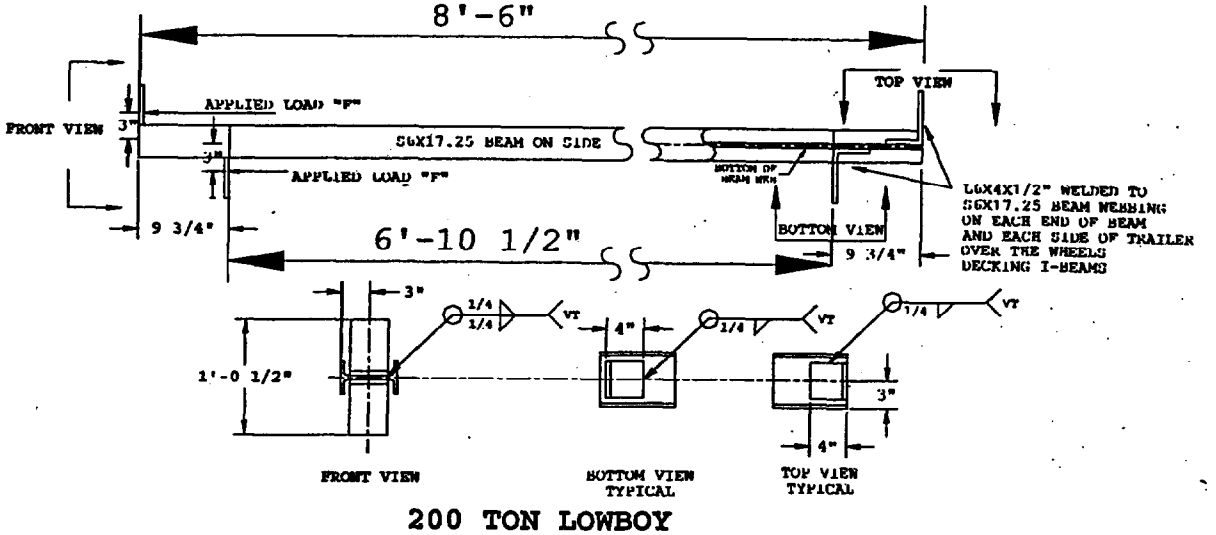


65 TON LOWBOY W/ T4 PACKAGE
TOP VIEW (BLOCKING)
DIMENSIONS ARE APPROXIMATE

Figures 5. Lateral Bracing Diagrams.

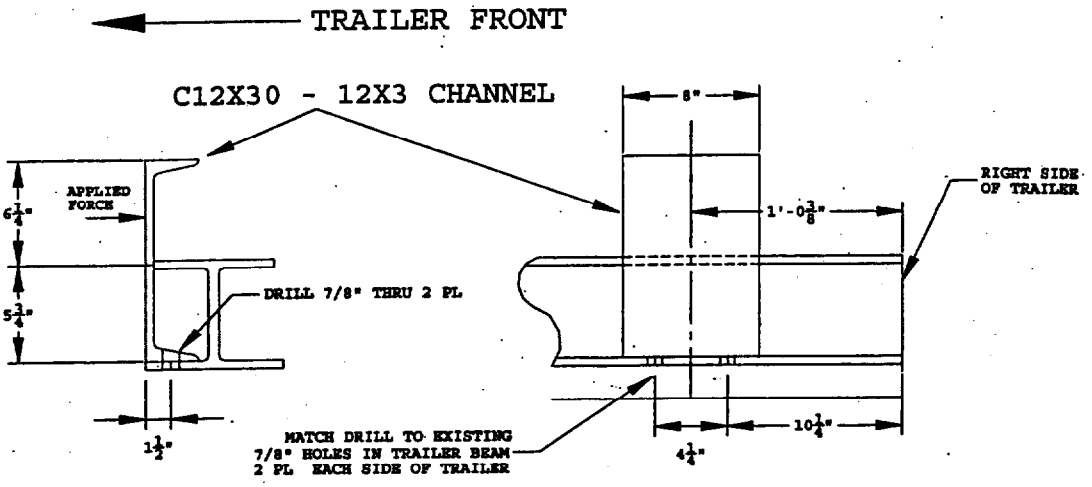


200 TON LOWBOY
LATERAL BRACING



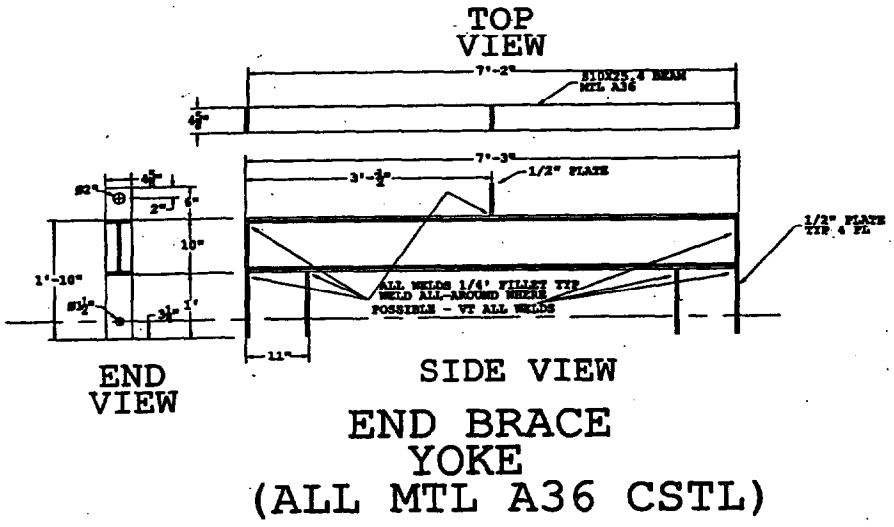
200 TON LOWBOY
LATERAL BRACING
OVER WHEELS

Figure 6. Kicker Plate Detail.



KICKER PLATE DETAILS

Figure 7. End Brace Yoke Detail.



6.1.1 Packaging, Tiedown, and Blocking and Bracing Requirements

Depending on conditions, the trough section can be wrapped prior to or after loading. Therefore, the following requirements should be completed in sequence.

6.1.1.1 Pre-Use Requirements

The trough section should be visually inspected for damage (e.g., cracks, uneven bottom surface, spalling, protruding rebar, sharp edges of concrete that may puncture or tear packaging or effect tie downs) that could affect structural integrity during the course of transportation.

1. Exposure of the tiedown components to dirt, weather extremes, water, or corrosives may reduce their strength, so these conditions should be avoided, if possible. Caution should be used to avoid kinking, crimping, or splaying chain, unless a documented rating of the strength can be established by testing following the repair.

6.1.1.2 Packaging Requirements

1. Sharp edges and corners on the trough sections should be padded to ensure that the flexible material is not damaged.

2. The package will be wrapped with the 4-mil minimum thickness of flexible material at least two times if the total surface area is less than 400 ft^2 or at least three times if the total surface area is greater than 400 ft^2.

3. A minimum amount of space should be left between the flexible material and the surface of the trough sections.

4. Reinforced cotton cloth tape or heat sealing should be used to seal the flexible material. Each individual flexible material packaging layer will be sealed.

6.1.1.3 Pre-Loading Requirements

1. Nails that hold the blocking to the decking shall be driven at right angles to the decking and staggered 2 in. apart. Nail holes shall be predrilled. At a minimum, blocking shall be constructed from 2 x 4 dimensional grade lumber. As a minimum, 10 d double headed, staging nails shall be used.

2. The trough shall have had liquids drained, as much as practical. Absorbents may be used to absorb residual liquids. No free liquids are allowed.

6.1.1.4 Pre-Shipping Requirements

1. Tiedowns or other restraining devices shall be padded or cribbed as necessary at contact points on the flexible material packaging to preclude the possibility of the flexible material being torn.

2. Flexible tiedowns should be free from contact with any other stationary objects when taut to prevent chafing and damage during transfer.

3. The load shall be inspected thoroughly by the shipper and carrier prior to release of the shipment. The shipper should ensure that the carrier recognizes his or her responsibility to check the tiedowns periodically during transit, and tighten them as necessary.

6.2 LOADING PROCEDURE

1. The flexible material packaging shall be lifted onto the transfer vehicle using the lifting plan. To prevent tearing of the flexible material, the sling shall be padded if the trough section is wrapped prior to lifting.

2. Prior to transfer, if the flexible material packaging shows any signs of deterioration or damage (due to loading), the package shall be over-wrapped in new flexible material or the breach be fixed using cloth reinforced tape.

3. If excessive loose material is present, efforts will be made to remove loose material prior to wrapping with flexible material. As much as practical, liquids shall be drained. Absorbents may be used to absorb residual liquids.

4. flexible material packaging needs to be protected from sharp edges, corners, chafing, rubbing, and stress with padding or otherwise protected to prevent damage to the flexible material packaging from surfaces that could damage the integrity of the flexible material packaging.

6.3 SHIPPING PROCEDURE

1. The BHI shipper shall review radiation levels as communicated by RadCon for both dose and removable contamination. The levels shall be evaluated against the limits allowed.

2. The BHI shipper should ensure that packages are conspicuously and durably marked as required by DOT.

3. The BHI shipper shall ensure that shipping papers are signed.

4. The BHI subcontract technical representative shall ensure that procedures are properly completed.

5. The BHI shipper should check that required driver qualifications and documented training has been completed, per DOT.

6. RadCon should verify the that flexible material packaging maintains containment. Radiation dose rates and contamination levels from the package shall be checked to ensure that all applicable radiological limits are not exceeded, prior to transportation.

7.0 QUALITY ASSURANCE

These requirements apply to the procurement, fabrication, inspection, testing, and utilization activities that could affect the quality of the packaging and associated hardware. The requirements are taken from the following documents: BHI quality assurance (QA) manual requirements and the FWEC QA plan:

- BHI-QA-01, *ERC Quality Program*

- Construction Quality Assurance/Control Plan for 116-N-3 Crib Demolition and Excavation, 100N-SC-G0058-2-008-07A, Foster Wheeler Environmental Corporation (BHI 2000).

BHI QA shall inspect all aspects related to this SSI as deemed appropriate.

FWENC QA shall review and approve all purchase requisitions and specifications for materials associated with the flexible material packaging, sealing devices, tiedown equipment or other specific components called out by in this SSI and inspect materials prior to use.

FWEC QA shall verify that the quality of items to be fabricated (including welding) in support of the shipping of oversize sections is performed by qualified personnel using applicable approved procedures.

FWEC QA shall develop checklists for use in their inspection of materials used in, and the packaging of, objects described in this SSI.

8.0 FORMS

All documents used to perform and/or verify quality-related activities shall be controlled. Controlled documents include (but are not limited to) plans, inspection and testing procedures (if any), reports, quality verification reports, nonconformance and corrective action reports, this SSI,

and operational and maintenance procedures. A copy of these documents shall be maintained at Document and Information Services (DIS), as necessary.

All QA records associated with the flexible material packaging shall be retained for 5 years. All lifetime storage QA records required for the flexible material packaging shall be stored with the user depending on the purpose of the document. QA records include (but are not limited to) shipping paperwork, onsite waste tracking form (OWTF), and exclusive use statements.

9.0 REFERENCES

10 CFR 830, "Nuclear Safety Management," *Code of Federal Regulations*, as amended.

40 CFR 263, "Standards Applicable to Transporters of Hazardous Waste," *Code of Federal Regulations*, as amended.

49 CFR 171, "General Information, Regulations, and Definitions," *Code of Federal Regulations*, as amended.

49 CFR 172, "Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements," *Code of Federal Regulations*, as amended.

49 CFR 173, "Shippers--General Requirements for Shipments and Packagings," *Code of Federal Regulations*, as amended.

49 CFR 177, "Carriage by Public Highway," *Code of Federal Regulations*, as amended.

49 CFR 393.100, "General Rules for Protection Against Shifting or Falling Cargo," *Code of Federal Regulations*, as amended.

BHI, 2000, *Subcontractor QA Program - Construction QA/Control Plan for Hanford 100-NR-1 TSD Remedial Action Project 116-N-3 Crib Demolition And Excavation*, 0100-N-SC-G0058-2-008-07A, Bechtel Hanford, Inc., Richland, Washington.

BHI, 2001a, *116-N-3 Main Trough Activities and Hazard Classification*, Calc. No. 0100N-CA-N0061, Bechtel Hanford, Inc., Richland, Washington.

BHI, 2001b, *Safety Analysis Report for packaging (onsite) Flexible Material Packaging*, DP-2001-003, Bechtel Hanford, Inc., Richland, Washington.

BHI-DE-01, *Design Engineering Procedures Manual*, "Engineering Design Project Instructions – Design Change Notice," EDPI 4.47-01, Bechtel Hanford, Inc., Richland, Washington.

BHI-EE-10, *Waste Management Plan*, Section 4.0, "Waste Shipping and Documentation," Bechtel Hanford, Inc., Richland, Washington.

BHI-EE-12, *ERC Transportation Manual*, Section 3.0, "Packaging Hazardous Materials for Transportation," Bechtel Hanford, Inc., Richland, Washington.

BHI-QA-01, *ERC Quality Program*, Bechtel Hanford, Inc., Richland, Washington.

DOE, 1992, *Hazard Classification and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*, DOE-STD-1027-92, U.S. Department of Energy, Washington, D.C.

DOE Manual 435.1-1, *Radioactive Waste Management Manual*, U.S. Department of Energy, Washington, D.C.

DOE Order 1540.1 *Materials Transportation and Traffic Management*, U.S. Department of Energy, Washington, D.C.

DOE Order 1540.2, *Hazardous Material Packaging for Transport-Administrative Procedures*, U.S. Department of Energy, Washington, D.C.

DOE Order 5480.3, *Safety Requirements for the Packaging and Transportation of Hazardous Materials, Hazardous Substances, and Hazardous Wastes*, U.S. Department of Energy, Washington, D.C.

FH, 2000, *Safety Analysis Report for Packaging*, HNF-SD-TP-SARP-007, Rev. 1, Fluor Hanford, Inc., Richland, Washington.

Obenauer, D.F., 2001, *Records Release*, Calculation No. 0100N-CA-C0051, Rev. 0, February 13, 2001, *Structural Integrity of Distribution Box (From Crib 116-N-3) During Transportation: Subcontract No. 015X-SC-G5009 (Mod 2),* (letter to R. Van Wormer, Dated February 20), Bechtel Hanford, Inc., Richland, Washington.

RCW 46, *Motor Vehicles*.

WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code*, as amended.

ATTACHMENTS

ATTACHMENT A

Material Checklist

Table 1

9.1.1.1 Item	Spec Info	Standard
Trailer	200-ton drop deck trailer 11 ft, 9 in. wide, 42 ft long.	Neil F. Lampson, Inc. Kennewick, Washington
Friction Mats	¼ in. thick, minimum	CCMTA (2.17 Friction Mats)
Flexible material packaging	4 mil thick layer of PERMALON X100 FR, GRIFFOLYN T-55 TR, LORETEX 2000/2000 FR-6, LORETEX 3000/3000 FR-7, and 4 mil layer of vinyl laminated cloth meeting military specification MIL-C-43006G, Types I and II, Class 1	
D-ring	WLL = 15,600 lb	
S Beam	A36 carbon steel, 6 x 17.25, 8 ft long, 12 ft long	AISC, Steel Construction Manual
Angles	6 x 4 x ½ in	
End kicker plates	C12x30 8" long	AISC, Case 25
End Brace Yoke	10x25.4 beam pinned to trailer, All MTL A36 CSL	AISC, Case 7
Chains	Alloy, Spectrum 8, 3/8 in., WLL = 7,100 lb.	
Chain Tie Down	WLL >/= 7,100 lb.	
Insulation	1 in. thick, rigid	
Wood (for blocking and bracing)	2 x 4 dimensional lumber, 5 x 5 blocking and others as needed. Species: red or white oak; white ash; yellow or sweet birch; American or slippery elm; hickory; hard, sugar or black maple; sweetgum; black cherry; southern pine; western pine; or fir. Straight grained and free of decay and strength impairing knots. Predrill all nail holes.	
Nails	10d, minimum double headed, staging nails. Driven at right angles, 2 in. stagger.	
Welds	All welds.	Structural Welding Code, AWS D1.1:2000
Bolts	¾ x 2"	ASTM A-325 or A-490
Shoulder Eye Bolt	WLL = 7100 lb	
Railroad Ties, as needed	Standard	

ATTACHMENT B

BHI Acceptance Checklist (Preliminary)

Item [approver]	Type of Inspection	Acceptance Criteria	Initials
Packaging [BHI shipper]	Visual, prior to packaging	No punctures, tears, or deterioration	
Packaging [BHI QA]	Inspection of FW QA for packaging	Meets criteria specified in this SSI	
S-beam lateral blocking [BHI QA]	Inspection of FW QA for S-beam	Visual, prior to initial use for each S-beam. A 6 x 17.25 S beam (AISC), laid on its minor axis in the form of an H beam, with a 6 x 4 x ½ in. angle welded to the web on each end and two 6 x 4 x ½ angles welded to the web 4 ft, 3 in. on either side of the beam center. Over the wheels, a 6 x 17.25 S beam, 8 ft, 6 in. long with a 6 x 4 x ½ in. angle welded to each end and welded 9 ¾ in. in from the ends with a span of 6 ft, 10 ½ in. face to face.	
Welding [BHI-QA]	Inspection of FW QA for S-beam	Copies of AWS welder's certification, copy of inspection report.	
Chain and tie down assemblies.	Visual – Prior to use	Verify tags or certification meets WLL >= 7,100 lb.	
Trough is properly wrapped with flexible material [BHI shipper]	Visual – Prior to each shipment	Sharp edges are padded, proper number of layers for size of shipment, all openings are sealed, no punctures, no tears or stretched areas. No free liquids.	
Flexible material packaging is properly tied down [BHI shipper]	Visual – Prior to each shipment	Tiedown scheme is per Section 6.1	
Procedures [BHI shipper]	Visual – Prior to shipping	Procedures have been properly completed. Inspections have been signed off.	
Load [BHI Shipper]	Visual – Prior to shipping	Inspect the contaminated item for damage that could affect tiedown.	

ATTACHMENT C

Points of Contact

Title	Primary Contact	Secondary Contact
ERC Project Management 100 N Remedial Action	Rick Donahoe 373-6230	Ernie Mokuiki 373-6894; 531-0600
Radiological Control Engineering	Steve DeMers 531-0729	Rob Sitsler 521-6634
ERC Regulatory Support	Jon Fancher 373-9123; 531-0700	Fred Roeck 372-9086
Waste Transportation Specialist	Patty Newman 373-2521; 531-0620	Bob Bidstrup 373-3310

083219

bcc:
E. L. Adamson X5-60
K. C. Baer X5-60
S. K. Demers X5-60
R. L. Donahoe X5-60
J. D. Fancher X5-60
K. W. Keck X5-60
R. B. Kerkow X5-60
L. R. Miller X5-60
E. K. Mokuiki X5-60
R. T. Moore X5-60
P. A. Newman X5-60
S. E. Parnell H9-01
D. M. Perry H0-04
J. K. Roth X5-60
S. G. Thieme X0-17
D. R. Thomas X5-60
D. A. Williams X5-60
Project File Copy (J[illegible]aPointe) X5-60
Document and Info[illegible]tion Service, H0-09

REVISED

Job No. 22192
Written Response Required: N/A
Due Date: N/A
Actionee: N/A
Closes CCN: N/A
OU: 100-NR-1
TSD: D-1-2
ERA: N/A
Subject Code: 9800, 8280

October 25, 2000

100NTSD-SC-051

Foster Wheeler Environmental Corporation
Mr. R. Dale Carruth, Project Manager
3200 George Washington Way, Suite G
Richland, Washington 99352

Subject: **SSI FOR SHIPPING TROUGH SECTIONS**
SUBCONTRACT NO. 0100N-SC-G0058
HANFORD ENVIRONMENTAL RESTORATION PROJECT
100-NR-1 TSD SITES REMEDIAL ACTION PROJECT

Dear Mr. Carruth:

The attached Site Specific Instruction for "Shipping Trough Sections Using Flexible Material Packaging" is issued to Foster Wheeler Environmental Corporation for your use.

Should you have any questions regarding this matter, feel free to contact me at 373-6894.

Sincerely,

Ernie K. Mokuiki
Subcontract Technical Representative

EKM:jll

BECHTEL HANFORD, INC.
3350 George Washington Way
Richland, WA 99352
tel (509) 375-4640
fax (509) 375-4644

HANFORD ENVIRONMENTAL RESTORATION PROJECT

SUBCONTRACT NO. 0100N-SC-G0058

EXHIBIT "E"

SPECIFICATIONS

EXHIBIT "E"
SUBCONTRACT NO. 0100N-SC-G0058
TECHNICAL SPECIFICATION INDEX

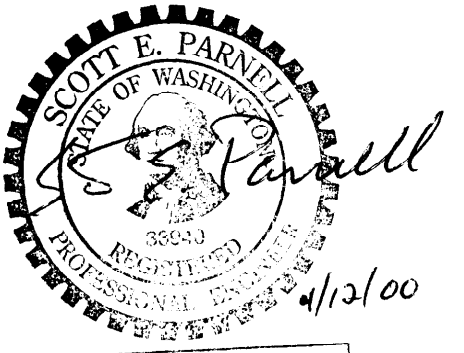
SPECIFICATION NO.	SPECIFICATION TITLE	REVISION
CIVIL		
0100N-SP-C0038	Earthwork and Excavated Materials Handling	Rev. 1
ELECTRICAL		
0100N-SP-E0017	Electrical Materials and Equipment	Rev. 1
MECHANICAL		
0100N-SP-M0014	Survey Station	Rev. 1

EXHIBIT E

TECHNICAL SPECIFICATION

FOR

EARTHWORK AND EXCAVATED MATERIALS HANDLING



BHI-DIS DEF 4/19/2000

REV.	DATE	REASON FOR REVISION	ORIGINATOR	CHECKER	GROUP SUPVR	PROJECT ENGR/DES
1	4/13/00	Issued for Construction	SEP	KEC	JAS	FMC
0	12/06/99	Issued for Bid	SEP	KEC	JAG	FMC

RICHLAND ENVIRONMENTAL RESTORATION PROJECT

JOB NO. 22192

SPECIFICATION NO. 0100N-SP-C0038

SHEET 1 of 41

TECHNICAL SPECIFICATION
FOR
EARTHWORK AND EXCAVATED MATERIALS HANDLING

Contents

TECHNICAL SPECIFICATION
FOR
EARTHWORK AND EXCAVATED MATERIALS HANDLING

1.0 GENERAL

1.1 SUMMARY

This specification establishes quality and workmanship requirements, and defines how quality is measured for earthwork and excavated materials handling activities.

1.2 ABBREVIATIONS

The abbreviations listed below, where used in this specification, shall have the following meanings:

ACM	asbestos-containing materials
ALARA	as low as reasonably achievable
AOC	area of contamination
ANSI	American National Standards Institute
ARA	Airborne Radioactivity Area
ASCII	American Standard Code of Information Interchange
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
CA	contaminated area
CADD	computer aided drafting and design
CFR	Code of Federal Regulations
DOT	Department of Transportation
DN	diameter nominal
ERC	Environmental Restoration Contractor Team
ERDF	Environmental Restoration Disposal Facility
FGCC	Federal Geodetic Control Committee
HCA	High Contamination Area
HRA	High Radiation Area
t	metric tons
NAD 83 ('91)	North American Datum of 1983, adjusted in 1991
NAVD 88	North American Vertical Datum of 1988
NESHAP	National Emissions Standards of Hazardous Air Pollutants
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety and Health Administration

PPE	personal protection equipment
QA/QC	Quality Assurance/Quality Control
RA	Radiation Area
RBA	Radiological Buffer Area
RCW	Revised Code of Washington
RMA	radioactive material area
SCA	Soil Contamination Area
SSRS	Subcontractor Submittal Requirements Summary
WAC	Washington Administrative Code
WSDOT	Washington State Department of Transportation

1.3 REFERENCES

The following references contain general information about the Hanford Site, geophysical interpretations of specific waste sites within the scope of work, acceptance criteria for disposal of contaminated material, and permit criteria for certain activities at the Hanford Site.

PNL-6415, Rev. 6	Hanford Site National Environmental Policy Act Characterization
BHI-00139, Rev. 3	Environmental Restoration Disposal Facility Waste Acceptance Criteria
BHI-01092, Rev. 1	100-NR-1 Treatment, Storage, Disposal Units Engineering Study
BHI-01271, Rev. 0	Data Summary Report for 116-N-1 and 116-N-3 Facility Soil Sampling to Support Remedial Design
BHI-DE-01, CADP-02	Drawing Format and Standards Guide
DOE/RL-93-80 Rev. 0	Limited Field Investigation Report for the 100-NR-1 Operable Unit
DOE/RL-96-11 Rev. 0	1301-N and 1325-N Liquid Waste Disposal Facilities Limited Field Investigation
DOE/RL-96-39 Rev. 0	100-NR-1 Treatment, Storage, Disposal Units Corrective Measures Study/Closure Plan

ERC-RAWD	Best Management Practice for Wet Cleaning and/or Decontamination of Equipment Working in Contaminated Areas, CCN 066634, dated March 1, 1999
HSRCM-01	Hanford Site Radiological Control Manual
WHC-SD-EN-TI-251, Rev. 0	100-N Area Technical Baseline Report

1.4 CODES, STANDARDS, LAWS, AND REGULATIONS

Unless otherwise approved or shown, the following Codes, Standards, Laws, and Regulations of the latest issue, at the time of bid, shall apply to establish the minimum requirements for activities within the scope of this specification. Referenced test methods, specifications, and recommended practices are to be used to verify material properties and to identify acceptable practices. Failure to identify applicable codes and standards does not negate the requirement to be knowledgeable of or to comply with applicable codes, standards, laws, and regulations.

10 CFR 835	Occupational Radiation Protection
29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1926	Safety and Health Regulations for Construction
40 CFR 61	National Emissions Standards for Hazardous Air Pollutants
40 CFR 122	EPA Administered Permit Programs
40 CFR 260-299	Protection of the Environment
49 CFR 172.504	General Placarding Requirements
49 CFR 173.24	General Requirements for Packagings and Packages
49 CFR 393	Parts and Accessories Necessary for Safe Operation
49 CFR 566	Manufacturer Identification
49 CFR 567	Certification
49 CFR 571	Federal Motor Vehicle Safety Standards
63 FR 7857	National Pollutant Discharge Elimination System for Storm Water Discharges from Construction Activities

ANSI/ASME	Applicable B30 Standards
RCW 46.37	Vehicle Lighting and Other Equipment
RCW 46.44	Size, Weight, Load
ST-4508	State Waste Discharge Permit for Hydrotest, Maintenance, and Construction
ST-4509	State Waste Discharge Permit for Cooling Water and Condensate
ST-4510	Hanford Storm Water NPDES Permit
WAC 173-216	State Waste Discharge Permit Program
WAC 173-303	Washington State Dangerous Waste Regulation
WAC 196	Professional Engineers and Land Surveyors
WAC 246-247	Radiation Protection – Air Emissions
WAC 332-130	Minimum Standards for Land Boundary Surveys and Geodetic Control Surveys and Guidelines for the Preparation of Land Descriptions
WSDOT M 41-10	Standard Specifications for Road, Bridge, and Municipal Construction

1.5 DEFINITIONS

1.5.1 Area of Contamination (AOC)

The plan area defined as 25 m beyond the limits of excavation.

1.5.2 Construction Drawings

Drawings and/or shop drawings supplied by SUBCONTRACTOR to be used for construction.

1.5.3 Container Handler

Generic term for manufacturers' standard equipment (e.g., a forklift or haul truck) for handling the specified containers.

1.5.4 Container Transfer Facility

The facilities and associated roadways and surfaced areas devoted to radiological surveying of the containers, container decontamination, container staging, container transfer to and from uncontaminated haul vehicles, and waste tracking.

1.5.5 Contaminated Material

Soil (ranging from silt to boulders) and material (concrete, timbers, piping, wire, trash, vegetation, etc.) contaminated above cleanup levels.

1.5.6 Disturbed Areas

Waste site excavations, borrow pits, access ramps, haul roads, the Container Transfer Facility, and ancillary facilities.

1.5.7 Project Drawings

Drawings supplied by CONTRACTOR and contained in Exhibit "F," Project Drawings.

1.5.8 Stripping

Removal and storage of uncontaminated surface material for future use as excavation backfill, including roots, organic materials, vegetation less than 1 m high, debris, cobbles, and boulders.

1.5.9 Survey Drawings

SUBCONTRACTOR supplied drawings showing grade and topography based on new civil survey.

1.5.10 Uncontaminated Material

Soil (ranging from silt to boulders) and construction material (concrete, timbers, piping, wire, etc.) excavated to gain access to contaminated material and verified at contaminant levels below the cleanup levels (radiological or chemical). Verification is not within the Scope of Work.

Areas or materials designated by the CONTRACTOR as "uncontaminated," may require radiological posting prior to verification of contaminant levels below the cleanup levels.

1.5.11 Waste Profile

The categorization of excavated materials in accordance with Environmental Restoration Disposal Facility (ERDF) waste acceptance criteria and the Supplemental Waste Acceptance

Criteria for Bulk Shipments to the ERDF (Attachment 1) by physical characteristics (e.g., soil, debris), chemical characteristics, contaminants present (e.g., specific radionuclide), and the level of contamination.

1.6 TECHNICAL SUBMITTALS

Submittals stated herein and elsewhere in this specification shall be submitted for review and approval in accordance with Exhibit "I," Subcontractor Submittal Requirement Summary (SSRS).

1.6.1 Plan Submittal Requirements

Submit for approval all components listed below. Submittals shall clearly state assumptions, conditions, and list references used. Any changes or revisions to original submittals will require resubmittal of documents. The following submittals shall be made:

1.6.1.1 Earthwork and Excavated Materials Handling Plan

A plan that details the methods, equipment, and scheduling of activities associated with earthwork and excavated materials handling. The plan shall include, but not be limited to, the following:

- Radiological control layout
- Radiological shielding requirements
- Stripping limits
- Excavation/demolition methods and material handling techniques
- Drainage Plan for Erosion and run-on/run-off control
- Dust control of temporary and/or long-term excavation and stockpile faces
- Size-reduction method for pipe, concrete, timber, and steel structures, to include removal and materials handling concepts
- Spill prevention and mitigation for materials such as contaminated materials, fuel, lube oil, and hydraulic oil
- Methods for protection of utilities
- Waste minimization, storage, packaging, and disposal

- Air emissions controls
- Management of water discharges
- Container liner handling procedures
- Decontamination methods
- Method for transferring containers to "uncontaminated zone"
- Container staging/management procedures (full and empty containers)
- Container waste tracking system from the point of filling to the point of departure from the Container Transfer Facility
- Method to ensure containers meet road weight restrictions
- Soil storage areas
- Asbestos abatement

1.6.1.2 Traffic/Access Control Plan

The SUBCONTRACTOR shall prepare and submit a Traffic/Access Control Plan describing at a minimum, how traffic and personnel will be directed, including speed limits and signage, to facilitate cleanup efforts and avoid accidents, for CONTRACTOR review. The Plan shall also describe how the SUBCONTRACTOR will maintain access control (allowing only authorized personnel into site boundaries), where fencing (permanent or temporary) and gates will be installed, when gates will be locked, and how gates will be controlled when unlocked.

1.6.1.3 As Low As Reasonably Achievable Plan

The SUBCONTRACTOR shall prepare and submit an as low as reasonably achievable (ALARA) plan describing at a minimum, how doses will be controlled, how dose tracking will take place, individual dose estimates, and any shielding requirements.

1.6.1.4 Grouting Plan

The SUBCONTRACTOR shall prepare and submit a grouting Plan describing at a minimum, sequencing, staging locations for grouting equipment, proposed grout mix, equipment to be used, location and methods for core drilling panels, and methods for placement of grout.

1.6.1.5 Construction Drawings

Construction drawings shall include, but not be limited to, the following:

- Road layout, sections, alignments, and grades compatible with the use intended
- Site layout plan showing proposed waste site and pipeline excavation plans and sections showing intended excavations and laybacks, including laydown and staging areas, access ramps, if appropriate, proposed haul roads, stockpile areas, storage areas, erosion and run-off/on controls, and container transfer facilities within approved access and transportation corridors
- Container Transfer Facility plans, sections, alignments, and grades
- Water fill station and fire hydrant tie-ins (components), pipe size, and pipe runs

2.0 MATERIALS AND EQUIPMENT

Unless otherwise specified, furnish and assume full responsibility for materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and other facilities and incidentals necessary for the furnishing, performance, quality control, testing, start-up, and completion of the Work.

2.1 MATERIALS

2.1.1 Crushed Surfacing Material

2.1.1.1 Top Course

Washington State Department of Transportation (WSDOT) M 41-10, 9-03.9(3), "Crushed Surfacing," for Top Course. The percent fracture requirement may be reduced to sixty percent (60%) from the seventy-five percent (75%) specified in the WSDOT standard specification.

2.1.1.2 Base Course

WSDOT M 41-10, 9-03.9(3), "Crushed Surfacing", for Base Course. The percent fracture requirement may be reduced to sixty percent (60%) from the seventy-five percent (75%) specified in the WSDOT standard specification. Crushed Surfacing for Base Course shall be obtained from stockpile at ERDF.

2.1.2 Subgrade

Material used for subgrade under the Container Transfer Facility and the related haul roads shall be existing site materials free of brush, weeds, vegetation, grass, and other debris.

2.1.3 Fill

Material used for fill above the subgrade shall be well graded existing site materials free of brush, weeds, vegetation, grass, and other debris as designated by the CONTRACTOR.

2.1.4 Backfill

Backfill material for the excavations shall be uncontaminated soil from on site materials as identified by the CONTRACTOR, or material from one of the approved borrow sites (refer to project drawings). The SUBCONTRACTOR may develop borrow pits both laterally and vertically within limits of the excavation permit. Material for the top 610 mm of backfill shall contain no rock larger than 152 mm. Materials from stripping shall be placed in the top 102 mm and shall be spread over the backfilled excavations.

2.1.5 Water

Water for dust control, compaction, or other approved uses is available at the hydrant, as shown on the project drawings. Fill pipe shall be tagged with a "Non-Potable Water" sign. Water from existing mains is not potable.

2.1.6 Soil Fixant

Soil fixant used to prevent dust movement shall be composed of non-regulated substances suitable for spray application. Prior to initiating work, manufacturer's descriptive literature describing product components and application instructions shall be submitted for approval.

2.1.7 Container Liner

The liner shall be a minimum 0.15 mm (6-mil) thick, flame resistant, clear, white, or black low-density polyethylene form-fitted type container liner (i.e., preformed with four sealed interior corner/seams, no envelope or flat style liners) of sufficient size to allow overlapping closure and sealing after container is filled. Liners shall be stored outside of the radioactive material storage area (RMA) of the Container Transfer Facility according to manufacturer's recommendations.

The liner shall be sized to fit inside the container and be folded over to completely surround the maximum container load.

The liner shall be sized such that when placed inside the empty container, the outside of the container is protected from spillage (contamination) during the loading operation.

2.1.8 Grout

Grout shall be a controlled density fill meeting the following specifications:

2.4-3.4 mPa at 28 day pumpable mix:

- 225 mm to 275 mm slump
- 120 kg/m^3 Type II cement minimum
- 360 kg/m^3 Flyash minimum
- 6% air entrainment
- "DuraFill™" added

2.1.9 Exclusion Fence

Exclusion fence shall be bright, visible orange colored, 1.2 m tall, made of polypropylene or high-density polyethylene with a breakload of 540 kg per m (360 lbs per ft) to 1,100 kg per m (740 lbs per ft.).

2.1.10 Concrete Barriers

Concrete barriers shall be type 2 concrete barriers, as defined in WSDOT Standard Plans C-8 or approved equal.

2.2 INSPECTION AND TESTING OF MATERIALS

The right to inspect and test materials to verify conformance with the specification requirements shall be reserved by the CONTRACTOR. If requested, material samples shall be furnished to the CONTRACTOR at no additional cost. Materials not in conformance with the specification requirements shall be removed from the site and replaced at no additional expense to the CONTRACTOR.

2.3 EQUIPMENT

2.3.1 General

Equipment designs shall be adequate for the intended service, compatible with containers, and comply with CODES, STANDARDS, LAWS, AND REGULATIONS. Equipment, either owned or leased, shall comply with Occupational Safety and Health Administration (OSHA) regulations 29 CFR 1910 and 29 CFR 1926, as applicable, and the American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME) B30 series of standards. Standard designs shall be modified, as necessary, even if such modifications are not specified herein. Equipment shall be operated by qualified personnel to safeguard adjacent workers from injury or prevent accidental release of contaminated material.

2.3.2 Equipment Safety

Excavation and materials handling equipment shall meet safe operating requirements (e.g., OSHA compliant). Vehicles operated on public highways shall comply with legal requirements. The vehicles shall conform to applicable federal and Washington State laws, including the following requirements, at a minimum: 46 RCW, 49 CFR (172 Appendix C, 393, 566, 567, 571). The vehicles shall also conform to applicable Department of Transportation (DOT) regulations. Vehicles shall include the following minimum safety equipment: fire extinguisher, reflector kit, first aid kit, and backup alarm.

A rigging plan shall be submitted in accordance with Exhibit "G" for any crane work.

Prior to mobilization, submit a letter of compliance stating that the equipment has been inspected and meets the requirements of Subcontract Documents.

2.3.3 Materials Handling Equipment

The excavated materials handling equipment and facilities shall be fully coordinated and compatible with the roll-on/roll-off containers and flatbeds specified below.

2.3.3.1 ERDF Containers

- Container Type: roll-on/off with open top
- Inside Dimensions: 6.10 m long, 2.13 m wide, 1.32 m tall
- Payload: 18.1 t, maximum

- Features: steel construction; single top-hinged or side-hinged end gate 203 mm diameter wheels at gate end; painted identification number; heavy duty top edge side rail and fork pockets to accommodate lifting by forklift.

2.3.3.2 B-25 (or approved equal) Waste Containers

- Container Type: Containers meeting requirements of 49 CFR 173.24
- Inside dimensions: 1.83 m long, 1.17 m wide, 1.19 m tall
- Payload: 4.53 t per container including grout cap
- Features: steel construction, fork risers to accommodate lifting by forklift

2.3.3.3 Roll-on/Roll-off Flatbeds

- The dimensions of the ERDF flatbeds are 2.5 m x 6.7 m with a payload capacity of 17.2 t.

2.3.3.4 Materials Handling Vehicles

Where required, excavated materials handling vehicles (Haul Trucks) shall haul the excavated materials from the excavation sites to either the appropriate Container Transfer Facility, nearby stockpiles, or storage areas. The vehicles typically operate on native materials in the excavation and on crushed surfacing material in the Container Transfer Facility. Some operation on hard-surfaced roadways may also be required. Loads on container haul vehicles will be limited by highway weight restrictions for ERDF destined wastes. The Hanford Site highway weight limit for a tractor-trailer unit with five axles is 36.3 t. Confirm current highway weight limits for vehicles to be operated on public roads. The SUBCONTRACTOR is responsible to ensure over the road weight restrictions are not exceeded. CONTRACTOR may impose weight-limiting controls on the ERDF transport vehicles. Any containers that exceed the weight limits controls will not be loaded and the SUBCONTRACTOR shall be responsible to offload material from the container to meet the weight restrictions. With CONTRACTOR approval, vehicles may be loaded to heavier gross weights for internal hauling (within the 100-N Area).

Haul truck hoist frames shall be the outside rail hoist type with outside to outside rail dimensions of 902 mm (35½ in.). Rails shall have no protruding objects and shall be free of additions that could damage the integrity of the container frame rails or roller structures. Trucks should utilize nominal 102 mm (4 in.) wide hoist frame rails and have side rollers that are 102 mm (4 in.) in diameter with a face of 89 mm (3.5 in.) to 102 mm (4 in.) wide. The haul trucks and hoists shall be configured to safely handle a variety of

containers from several manufacturers having the following common dimensions and characteristics:

- Gross weight of 21.0 t for container and load
- Overall container lengths of from 6.1 m (20 ft.) to 6.7m (22 ft.)
- "Doghouse" type front hook
- Front engagement (or pick up) roller diameter of 102 mm (4 in.) and face length of 142 mm (5 5/8 in.) to 165 mm (6 ½ in.)
- Front engagement roller centerline is 162 mm (6 3/8 in.) above the bottom of the container long sill.
- Front of container hold down skid is 5.94 m (19 ft, 5 ¾ in. from the centerline of the front engagement roller.
- Container hold down skids range from 991 mm (39 in.) to 1.12 m (44 in.) apart (inside to inside) and 1.37m (54 in.) to 1.46 m (57 ½ in.) apart (outside to outside). The skid bottoms drop from 127 mm (5 in.) to 152 mm (6 in.) from the top of the container long sill.
- Container long sills (or rails) are constructed of 152 mm (6 in.)x 51 mm (2 in.) square tubing with 921 (36 ¼ in.) to 940 mm (37 in.) rail spacing inside to inside.
- Container long sills have approximately 152 mm (6 in.) clearance between the bottom of the rail and the bottom of the container cross members.

Hoist frames shall be equipped with a gravity activated container lock to prevent container movement while the hoist frame is in the down position.

The above information is provided using industry standard nomenclature relative to the characteristics and dimensions of CONTRACTOR supplied roll-on/roll-off containers. The information provided to SUBCONTRACTOR, although specific to available knowledge, is intended to ensure SUBCONTRACTOR provides handling equipment compatible with CONTRACTOR'S containers. Ultimately, the SUBCONTRACTOR is responsible for roll-on/roll-off container handling equipment that ensures the safety of personnel and safe operation of equipment during routine operations.

2.3.4 Personal Protection Equipment

Personal protection equipment (PPE) shall meet current standards as defined in Exhibit "G". Respiratory protection shall be administered in compliance Exhibit "G".

3.0 EXECUTION

3.1 FIELD OPERATIONS

3.1.1 Excavation Work Area

3.1.1.1 Exclusion Areas

Exclusion area fence shall be placed where shown on Exhibit "F," Project Drawings; no work shall be performed within the exclusion areas. Any deviations shall require written approval by the CONTRACTOR.

3.1.1.2 Stripping

Strip area for the Container Transfer Facility and haul roads along with areas required to facilitate the use of equipment and/or construction and installation of facilities. Strip work and storage areas, as necessary, to facilitate construction and eliminate potential fire hazards. Stripping shall be to a nominal 150 mm. Handling of stripped materials shall be as directed in Section 3.1.6 of this specification.

3.1.1.3 Civil Surveying

Survey crew personnel shall be competent and experienced in performing land surveys. Work shall be performed using metric system under the direct supervision of a Land Surveyor registered in the State of Washington. Drawings and calculations shall be signed, sealed, and certified by a Land Surveyor registered in the State of Washington.

Standards of accuracy for survey work shall be in accordance with Federal Geodetic Control Committee (FGCC) standards and the minimum standards as set forth in the WAC 332-130. The datum for the horizontal control network in Washington shall be NAD 83. Elevations and benchmarks shall be provided in NAVD 88. The class of control surveys shall be shown on all documents prepared.

Completed survey information shall be submitted in the form of a survey drawing for project review and approval. Survey drawings shall be produced at a metric scale of 1:1000, with contours shown for each 0.5 m of vertical relief in NAVD 88. Survey drawings shall be created on a Computer Aided Design Drafting (CADD) system and shall be in accordance with BHI-DE-01, CADP-02. CADD drawings shall be submitted

electronically in AutoCAD™ 14 or CONTRACTOR approved version (dwg format). An ASCII file of the survey data, as collected by an electronic data collection system and a printout of the data, shall be submitted.

3.1.1.4 Drainage/Erosion Control

The SUBCONTRACTOR shall provide channels or berms around excavations to intercept and direct water away from the work and prevent materials from reaching the Columbia River consistent with the Hanford Stormwater National Pollutant Discharge Elimination System (NPDES) Permit. Excavations shall be maintained in a dewatered condition. Water entering the excavations, including seepage, snow or ice melt, and rainfall, shall be controlled and standing water removed before personnel enter to perform Work. Water removed from the excavation shall be stored in CONTRACTOR approved containers and subsequently sampled and analyzed by the CONTRACTOR prior to disposal. Water removed from the excavation may be used/recycled with CONTRACTOR approval. Methods such as channeling, harrowing, and/or addition of additives shall be considered. Only approved methods shall be employed. Contaminated material containing free water shall be dried prior to excavation. Uncontaminated materials that contain free water may be excavated with prior approval.

3.1.1.5 Excavation Safety

Excavations shall be performed in accordance with OSHA 29 CFR 1926. SUBCONTRACTOR shall document the criteria for each activity requiring a competent person. The excavation shall be inspected by the SUBCONTRACTOR's competent person prior to beginning work each shift. Inspections shall be documented and shall include review of administrative and engineering controls, as appropriate. No personnel or equipment shall enter the excavation until required corrective measures are completed and documented. Equipment and excavated materials shall not approach or be placed near the edge of excavations unless safety measures have been implemented.

3.1.1.6 Inactive Excavations

The SUBCONTRACTOR shall secure access to open excavations by placing adequate physical barriers across any unsecured access points. Danger/Warning signs shall be placed as directed by CONTRACTOR. Walkways or bridges shall be constructed and inspected in accordance with applicable OSHA requirements when an excavation requires access.

3.1.1.7 Access/Egress from Excavations

Access/egress from excavations (e.g., ladders, stairs, and ramps) first aid equipment, PPE, and emergency rescue equipment (e.g., body harness, respirators, etc.) shall be provided in accordance with OSHA 29 CFR 1910 and 1926.

3.1.1.8 Shoring and Bracing

Install and maintain shoring, sheeting, bracing, and sloping necessary to support the sides of the excavation to prevent any movement that may damage adjacent roadways, utilities, or structures, damage or delay work, or endanger the safety and health of personnel. Shoring, sheeting, bracing, and sloping shall be installed and maintained, as required by OSHA and other applicable regulations and agencies.

3.1.1.9 Protection of Utilities

Active utilities shall be protected from damage and disruption of service during excavation activities. Methods for protection of utilities shall be submitted and approved prior to excavation. The SUBCONTRACTOR shall be responsible for field verifying and locating underground utilities prior to excavation activities. Should the SUBCONTRACTOR damage or place out of service any utilities, all associated costs for repair shall be borne by the SUBCONTRACTOR. The CONTRACTOR shall be notified immediately of each incident. Corrective repair work shall be completed by the SUBCONTRACTOR within 24 hours after damage or loss of service.

3.1.1.10 Grouting

Holes in the 116-N-3 Crib cover panels shall be 125 mm diameter and located to avoid cutting through prestressing tendons. The maximum loading per panel shall not exceed 225 kg. Grout shall be placed using a boom style, truck mounted concrete pump with a minimum 31 m horizontal reach. The grout shall be placed at a rate of 2 to 3 cubic meters per minute and to a minimum depth of 150 mm in the laterals and 760 mm in the main trough. Pipe shall be blocked as shown on project drawings.

3.1.2 Earthwork

Earthwork associated with the construction of the Container Transfer Facility and the connecting roads shall be performed in accordance with the approved earthwork plan, project drawings, and specifications.

3.1.3 Excavation

3.1.3.1 General

Waste sites shall be excavated as shown on the construction drawings and in compliance with the earthwork plan. Contaminated material shall be placed directly into containers or (upon CONTRACTOR approval) stockpiled for temporary staging. Stockpiling shall be either within the AOC or within a materials staging area. Loaded containers shall be hauled to the container transfer facility and staged for pickup by others. Loaded containers must meet radiological release requirements prior to pickup and transport from the contaminated area.

Excavations and operations shall be planned and executed in compliance with the applicable requirements in OSHA 29 CFR 1926, Subpart P - Excavations. Excavation has not been classified. Complete excavation regardless of the type, nature, or condition of the materials encountered.

The range of in place density for soil (from silt to boulders) is expected to range from 1.9 t per bank cubic meter to 2.4 t per bank cubic meter .

Swell factors for estimation of loose densities from in place densities will also vary depending upon many factors including moisture, specific material types, and handling method. Swell factors are anticipated to range from 10% to 20%.

3.1.3.2 Excavation Operations

3.1.3.2.1 116-N-3

Begin preparation for the demolition work at dam #1 by wetting and applying soil fixants to the soils in the bottom of the trench below the double tee panels. The 1st panel shall be demolished in place after CONTRACTOR approves the wetted condition of the soils in the bottom of the trench. The operations shall continue from dam #1 toward the crib by wetting the soils and applying fixants to soil in the bottom of the trench prior to demolishing each panel.

After the double tees are demolished, the trench excavation shall begin at dam #1 loading soil and demolished double tees into ERDF containers. The excavation shall be performed from the top edge of the trench and continue from Dam #1 towards the crib. Dose rates in the bottom of the trench prohibit access by personnel or equipment.

The tie in structure between the trench and crib shall be demolished in-place and loaded directly into ERDF containers.

Excavation of the crib shall begin with the removal of the panels in a quadrant format, one quadrant at a time (i.e., Northwest, Southwest, Southeast, and Northeast). For each quadrant, the panels shall be removed in one piece, providing a clean break at each grouted connection point (panels shall not be dropped or demolished on underlying soils), loaded, packaged, and transported to the Container Transfer Facility.

Once a panel is removed, the SUBCONTRACTOR shall place 510 mm of soil on the existing surface of the crib to provide shielding. The soil shall be obtained from surrounding areas (within 1 km) as directed by the CONTRACTOR. The SUBCONTRACTOR shall continue removing panels and placing soil per each individual quadrant up to the main trough. As panels are removed the support girders and laterals are exposed, the SUBCONTRACTOR shall remove the support girders to the size reduction area and cover the laterals with 510 mm of soil.

Once the panels and support girders for two (2) adjacent quadrants have been removed, the SUBCONTRACTOR may remove that portion of the center trough and associated girders, roof panels, between the two removed quadrants and separate the lateral weir boxes from the main trough. As portions of the center trough are removed, the SUBCONTRACTOR shall immediately place 510 mm of soil on the existing surface of the crib to provide shielding.

The main trough shall be sectioned into 9.1 m lengths with a diamond wire saw, or approved equal. SUBCONTRACTOR shall fix in place and protect the spread of contamination prior to the removal from the crib, during packaging activities, and loading onto transport vehicle. SUBCONTRACTOR shall complete all work in all four (4) quadrants and removal of the main trough prior to crib soil excavation to depth. Laterals shall be excavated along with the crib soil excavation to depth.

3.1.3.2.2 116-N-1

Excavation shall begin at trench and progress towards the crib. A minimum of 300 mm of soil shall be placed on the crib surface prior to beginning excavation. The soil shall be from the drill pad shown on project drawings. Excavation of the trench shall be similar to that of 116-N-3, wetting soils beneath panels and girders prior to demolishing in place. Demolished panels and soil shall be loaded into ERDF containers.

3.1.3.3 Field Screening

Field screening for contaminants will be used to assist in the establishment of current waste characteristics concurrently with the excavation of new materials. Newly exposed materials will be analyzed by CONTRACTOR using in situ measurements or samples of the materials to determine the radioactivity levels of the radionuclide contaminants. Excavation may be temporarily halted by CONTRACTOR to facilitate and safeguard the analytical work.

Newly exposed soils will also be periodically analyzed per the established sampling plan (sampling and analysis not within SUBCONTRACTOR scope of work) to determine the waste characteristics regarding other contaminants (e.g., organic or inorganic chemicals). Excavation may be temporarily halted by CONTRACTOR to facilitate and safeguard the sampling work. Access to sample points will be accomplished by 1) contouring the excavation and/or providing (and installing) shoring/ramps to permit manned entry in accordance with the requirements of OSHA and/or 2) retrieving soil with excavation equipment from excavation locations determined by the CONTRACTOR.

The CONTRACTOR will determine the waste characteristics and the radiological classification of excavated material. Field screening will be used prior to and during excavation activities to classify excavated material as contaminated or uncontaminated. Uncontaminated material may contain contaminants, which exceed cleanup levels, but cannot be readily detected by field screening. Quick turnaround laboratory analysis (24 to 72 hours) will be used to verify uncontaminated material. Double handling will be required if quick turnaround analysis indicates that initially designated uncontaminated material exceeds cleanup criteria.

The CONTRACTOR will perform field screening intermittently throughout the excavation process and may be necessary at the excavation bucket. Field screening frequency will increase as excavation depth increases. If radiological screening results show increased radioactivity, the frequency of field screening will increase. Particular attention will be paid to soil at pipe couplings, flanges, joints, valves, inspection manholes, and associated structures. Random screening of the spoil pile(s) or surface of the excavation will occur unless lithologic/color changes become apparent or buried debris and pipes are encountered. If these indicators are encountered, the frequency of field screening will increase.

3.1.3.4 Verification Sampling

Upon completion of waste site excavation, access to the excavation side wall and bottom soil will be required at discrete sample points for clean site verification sampling. Access to sample points will be accomplished by 1) contouring the excavation and/or providing

(and installing) shoring/ramps to permit manned entry in accordance with the requirements of OSHA and/or 2) retrieving soil with excavation equipment from excavation side walls and bottom at locations determined by the CONTRACTOR. Any portion of equipment used for contouring or retrieving soil (e.g., trackhoe bucket) shall be clean and free of radiological and chemical contamination so as not to cross contaminate the excavation. Should cross contamination occur, costs for additional excavation and decontamination shall be borne by the SUBCONTRACTOR.

The term "free of radiological contamination" means removable contamination less than 1,000 dpm/100 cm^2 beta-gamma and 20 dpm/100 cm^2 alpha (transuranics), plus less than 5,000 dpm/100 cm^2 (total and removable) beta-gamma and 100 dpm/100 cm^2 (total and removable) alpha (transuranics).

After removal of contaminated material, clean site verification sampling for pipelines shall occur at intervals of 200 linear meters nominal or as adjusted in the field based upon conditions encountered. Samples will be taken at random points within the 200 linear meter interval.

The SUBCONTRACTOR shall collect and archive sample material, as directed by the CONTRACTOR, in a RMA, set up near the work area. During site demobilization the SUBCONTRACTOR shall dispose of archived sample material (ship to ERDF or permanent on-site RMA).

Spoils piles will be subject to sampling by the CONTRACTOR to determine if overburden material and other uncontaminated spoils are acceptable for use as backfill. The SUBCONTRACTOR shall ensure CONTRACTOR access to such spoils piles for sampling. Handling or adding to spoil piles will not be permitted after sampling without CONTRACTOR approval.

3.1.3.5 Cross Contamination of Excavated Areas

The excavation shall be sequenced such that areas already excavated are not cross contaminated. Cross contamination due to pipe removal and/or size reduction (from pipe scale, rust, etc.) shall be removed from the excavation or staging area upon completion of pipe removal and/or size reduction activities. Side slopes of excavations shall be protected to prevent contaminated materials from eroding or sloughing into and contaminating materials at a lower elevation. Any additional material removal and replacement due to cross contamination shall be performed at no additional expense to the CONTRACTOR.

3.1.3.6 Trenching and Potholing

Trenching and potholing may be required to assess contaminant distribution associated with pipelines and waste sites. The trenching technique shall be utilized to identify contamination associated with pipelines. The trench shall have a maximum length of 9.14 m, a minimum width of 1.2 m, and a maximum depth of 4.57 m.

The potholing technique shall be utilized to identify contaminant distribution associated with waste sites. The potholes shall have a maximum length of 3 m, a maximum width of 3 m and a maximum depth of 4.57 m.

3.1.3.7 Radiological Dose Limitations

A combination of shielding, time and distance will be used to ensure worker exposure to external radiation is as low as reasonably achievable (ALARA). No individual may receive a dose in excess of 500 mrem per calendar year. Substitutions of employees to meet this limitation are not acceptable. Individual task operations (e.g., excavation, transport, queue operations, etc.) must also be limited to less than 500 mrem per calendar year.

3.1.3.8 Work Zone Delineation and Radiological Control

116-N-3, 116-N-1, 120-N-1, 120-N-2, and 100-N-58 currently exist within a Radiologically Controlled Area (RCA). SUBCONTRACTOR work at 120-N-1, 120-N-2, and 100-N-58 will not require radiological controls. The Hanford Site Radiological Control Manual (HSRCM-01) shall be used for posting guidance. HSRCM-01 and 10 CFR 835 shall be used for guidance to control work and to protect workers in radiological areas; both are publicly available documents.

The delineation and posting of these radiological work areas will be used to maintain radiological control of the work area and to minimize the potential for cross contamination outside of the contaminated work area. Work zone delineation and radiological control shall comply with the CONTRACTOR'S radiological control program, which is implemented through HSRCM-01. Any work area where radioactive contamination exists or is likely to exist, shall be posted by the SUBCONTRACTOR as a Contaminated Area (CA), a Soil Contamination Area (SCA), or other as directed by the CONTRACTOR. A Radiological Buffer Area (RBA) will be posted around the contaminated work area (CA, SCA, etc.), by the SUBCONTRACTOR, as directed by the CONTRACTOR. Equipment and personnel will be subject to a contamination survey upon exit from a radiological area, an RBA, an SCA requiring a Radiological Work Plan, an Airborne Radioactivity Area (ARA), a CA and/or a High Contamination Area (HCA),

as directed by the CONTRACTOR. Decontamination may be required to release personnel or equipment from areas containing radioactive contamination.

An area will be designated as the access/exit point from CA, HCA, and ARA. These access/exit points should be chosen to maintain exposure ALARA and may require additional SUBCONTRACTOR-supplied radiological shielding. This area shall be for the purpose of Anti-C disrobing, personnel surveying, and potential decontamination. The access/exit points will include, as a minimum, a step-off pad, laundry receptacle (for contaminated Anti-Cs), shoe cover receptacle, and trash receptacle.

The SUBCONTRACTOR shall provide and maintain RMA for the storage of radioactive material and equipment used to support radiological work in accordance with HSRCM-1. Only labeled radioactive material may be stored in the RMA. The RMA shall be posted by the SUBCONTRACTOR as directed by the CONTRACTOR. The RMA will contain material stored in sealed bags, boxes, drums, etc. The SUBCONTRACTOR shall ensure radioactive material is protected from intrusion of the elements (i.e., precipitation, runoff, dust, etc.) or shall move the RMA, as necessary, to keep the stored material protected from the elements.

3.1.4 Separation of Excavated Materials

3.1.4.1 General

Excavated materials will be considered either as uncontaminated material (subject to verification) or contaminated material. Specific form waste such as asbestos or demolition debris, will be categorized as either uncontaminated material or contaminated material, dependent upon the level of contamination.

3.1.4.2 Uncontaminated Materials

Verification that uncontaminated materials have contaminant levels below clean-up levels will be required prior to use as backfill. The CONTRACTOR will perform the verification. Whenever feasible, efforts shall be made to minimize the amount of materials ultimately disposed of at the ERDF.

3.1.4.3 Contaminated Materials

Contaminated materials will typically be within waste site boundaries. Contaminated materials will be assigned a waste profile based on process knowledge and field screening by the CONTRACTOR.

The waste profile may change, as directed by the CONTRACTOR, based on changing field characteristics detected by field screening or sample analysis.

Asbestos containing materials encountered during excavation work shall be managed in compliance with 40 CFR 61.140 through 157. Asbestos-containing materials requiring removal shall be performed by a supervisor and work crew that meet asbestos training requirements and comply with all the SUBCONTRACTOR health and safety programs. Asbestos-containing materials shall be packaged for removal in compliance with the ERDF Waste Acceptance Criteria (WAC).

Contaminated material containing free water, as determined by WAC 173-303-140 (4) (b) (Method 9095 - The Paint Filter Liquids Test), shall be dewatered or dried prior to transport from the Container Transfer Facility to ERDF.

3.1.5 Demolition and Removal of Structures and Abandoned Utilities

Demolish concrete, wooden or steel structures, piping and miscellaneous small-diameter utility piping, conduits, and wiring, as shown on the project drawings and as directed by the CONTRACTOR. Demolition shall consist of cutting, size reducing, demolishing, or reducing to rubble in order to meet inert landfill, backfill, or the ERDF WAC, whichever is applicable. SUBCONTRACTOR shall confirm that existing abandoned utilities are inactive before demolition.

Contaminated materials demolished and removed shall be loaded into ERDF containers as to not damage cover tarps. Containers shall have a 150 mm bed of soil underlying concrete and steel debris, pipe sections, cobbles, and boulders.

3.1.5.1 Size Reduction for Contaminated Material

Contaminated concrete shall be loaded into ERDF containers in one of two different forms: 1) reduced to rubble with a maximum dimension of approximately 300 mm or 2) as approved by CONTRACTOR, large blocks or slabs that fit inside an ERDF container without wedging into the chamfered portion of the container or extend above the walls, not to exceed the payload limit for the container (18.1 t), and loaded toward the rear of the box. Rebar shall be cut flush (less than 150 mm) with the surface. Loose rebar shall be cut to lengths of approximately 1.2 m and mixed with soil to the extent practical and placed to prevent damage to the tarp during handling (no rebar or concrete shall extend above the sidewalls of the container).

Steel plate shall not exceed 1.2 m in width or 3.0 m in length, shall not extend above the side walls of the container, shall not be bent over or folded to fit into containers, and shall be shipped separate from soils in containers. Steel plate shall not be forced or pushed

into the container in a manner that would inhibit it from sliding out of the container when dumped. Cribbing may be necessary to avoid binding of steel plate during unloading.

Extraneous attachments or extensions (e.g., flanges, valves, welded plate, protruding reinforcing steel from reinforced concrete debris, etc.) to individual pieces of pipe shall be removed.

Steel and cast iron pipe with diameters ≥DN1200 shall, at a minimum, be split in thirds lengthwise and sized less than 3 m in length. All lengthwise cuts shall be made with hydraulic shears. These pipe sections shall be nested (placed one length inside the other, with open side up) within the containers to maximize the load without exceeding the load limit per container or extending above the side walls of the container.

Steel and cast iron pipe with diameters ≥DN450 and <DN1200 shall, at a minimum, be split in half lengthwise and sized less than 3 m in length. All lengthwise cuts shall be made with hydraulic shears. These pipe sections shall be nested (placed one length inside the other, with open side up) within the containers to maximize the load without exceeding the load limit per container or extending above the side walls of the container.

Steel and cast iron pipe with diameters ≥DN50 and <DN450 are not required to be split and may be loaded in lengths up to 3 m. Tube steel sections shall have open ends to permit entry of grout.

Steel and cast iron pipe with diameters <DN50 may be shipped with split, larger-sized pipe, or metal sheet/plate in lengths up to 3 m.

Any individual piece of miscellaneous metals/building debris/structural steel/conduit shall not exceed 1.2 m in width, 0.6 m in depth, or 3 m in length. The waste shall not be bent over or folded to fit into containers and shall be shipped separately from soils in containers to the maximum extent possible. The waste shall not extend above the side walls of the container, and shall not interfere with the tarps placed over the containers, or be loaded in the containers so as to become unstable during loading/unloading operations.

For any discrepancy found between specification criteria and Attachment 1, the more restrictive shall apply with the exception of the container payload. The container payload shall not exceed 18.1 t (40,000 lbs.).

Debris greater than 300 mm in any one dimension shall be loaded into side hinged containers only.

3.1.5.2 Size Reduction for Uncontaminated Material

Uncontaminated material shall be size reduced in one of two ways. Uncontaminated material that will be hauled to the inert landfill shall be reduced to a size which will comfortably fit in the back of the SUBCONTRACTOR supplied haul trucks. Uncontaminated material that will be placed in the uncontaminated portion of the trenches shall be reduced to a size no greater than 1 m in any dimension.

3.1.5.3 Asbestos-Containing Materials

Asbestos-containing materials (ACM) shall be removed from piping prior to circumferential cuts for size reduction. ACM may be left in place during lengthwise cuts for size reduction. All lengthwise cuts shall be made with hydraulic shears. During asbestos removal activities of the pipelines, the SUBCONTRACTOR is responsible for all monitoring and posting requirements. Clearance sampling (air sampling) associated with pipe abatement is not required, visual inspection will support ACM down posting. SUBCONTRACTOR personnel at the excavation site shall provide intermittent wetting with water spray nozzles to provide dust control and prevent uncontrolled air emissions.

ACM waste shall be wetted, double-bagged, and shipped separately in containers or packages provided by the CONTRACTOR, complying with Section 4.2.2 of the ERDF Waste Acceptance Criteria and the Supplemental Waste Acceptance Criteria for Bulk Shipments to the ERDF (Attachment 1). Bags shall be limited to a maximum weight of 18.1 kg (40 lbs) in order to be handled by an individual worker. Pipes containing ACM may be shipped (wetted and double bagged) after size reduction.

Intermittent wetting of pipe bearing ACM is required during all mechanical pipe cutting and pipe removal operations. During ACM removal all pipe bearing ACM shall be placed on two layers of 6 mil (or greater) plastic sheeting, and all remaining ACM shall be removed utilizing wet methods per routine OSHA and NESHAP guidance.

Asphaltic mastic residue with no visible signs of ACM may remain on the pipes.

3.1.5.4 Exposed Piping

After contaminated material has been removed, remaining piping and conduits exposed or within 1.5 m of a building, shall be capped or blocked. Pipes >DN300 shall be capped by first wrapping and taping with 0.25 mm (10-mil) reinforced polypropylene bags or sheets and then boxing the end with 19 mm exterior grade plywood as necessary for protection from backfill materials. Nominal DN300 pipes and smaller shall be capped, sealed with grout, or crushed shut if feasible.

3.1.6 Disposal of Materials

3.1.6.1 Uncontaminated Material

Uncontaminated vegetation obtained from site stripping shall be transported to the Uncontaminated Soil Storage Area and placed in a separate stockpile to be shown on the construction drawings. Other uncontaminated materials shall be stored or disposed by the SUBCONTRACTOR at a CONTRACTOR approved inert landfill within 17 km of the site.

The inert landfills (clear wells) are large on-site retired basins used for disposal of non-hazardous and non-radioactive inert or demolition waste, and are accessible by conventional dump trucks. The SUBCONTRACTOR shall request and coordinate with the CONTRACTOR regarding waste streams (material) to be disposed and CONTRACTOR will coordinate with the on-site Waste Operations Group. SUBCONTRACTOR may be required to apply a daily 150 mm ground cover (from a CONTRACTOR approved borrow source) on top of disposed material/debris.

Uncontaminated soil material ranging in size from silt to boulders may be stockpiled near the excavation from which it came. Double handling and transport of this material will be required if the material cannot be verified as uncontaminated or the stockpile location interferes with ongoing construction/remediation activities (e.g., contamination is detected in soil underlying the stockpiles). Double handling and transport of the soil shall be done at no additional cost to the CONTRACTOR. Containers for uncontaminated material are to be supplied by the SUBCONTRACTOR.

3.1.6.2 Contaminated Material

Contaminated material shall be loaded into containers and transported to the Container Transfer Facility where the material will be staged or transferred to transportation vehicles for ERDF disposal. The contaminated material placed in containers shall comply with the moisture content and other applicable requirements of the ERDF WAC and Supplemental WAC for Bulk Shipments to the ERDF (Attachment 1).

3.1.7 Excavated Materials Handling

3.1.7.1 ERDF Container Liner

Install the container liner in each container prior to loading contaminated materials. The container liner shall be placed inside the container and draped over the sides of the container. After materials are loaded into the container, the liner shall be folded and secured over the materials.

3.1.7.2 ERDF Container Loading

Containers shall be loaded evenly throughout. Material shall be placed to prevent movement or shifting of the load and damage to the container. Large materials shall not be placed directly against the rear gate. Material shall be able to be freely discharged when emptied at ERDF. The SUBCONTRACTOR shall be responsible for removing oversize material that does not freely discharge while emptying at ERDF.

3.1.7.3 B-25 Container (or approved equal) Loading

Containers shall be loaded evenly throughout and capped with 150 mm of grout to top of container. Material shall be placed so as not to cause any damage to the container. B-25 boxes shall be loaded onto ERDF roll-on/roll-off flatbed trailers.

3.1.7.4 Prevention of Liquid Accumulation in Containers

Containers (empty/full) shall be protected from the accumulation of free liquids. SUBCONTRACTOR shall not apply excessive amounts of water, which may cause soil to become saturated when placed into the containers. The SUBCONTRACTOR shall be responsible for preventing the accumulation of free standing water and release of water from containers waiting for transport to ERDF.

3.1.7.5 SUBCONTRACTOR Flat Beds/Low Boys

Material shipped on SUBCONTRACTOR trailers shall be packaged with flexible material (4 mil minimum thickness for each layer) wrapped and sealed around the radioactively contaminated item or with application of spray-on material (Pro-Tex Polyshield SS-100, an elastomeric polyurea coating). The flexible materials authorized for usage are: PERMALON XIOO FR, GRIFFOLYN T-55 TR, LORETEX 2000/2000 FR-6, LORETEX 3000/3000 FR-7, or Vinyl laminated cloth meeting military specification MIL-C-43006G, Types I and II, Class 1. The spray-on material shall be sprayed to a minimum thickness of 0.08 cm (0.03 in) with a color different from the item being sprayed. Openings and spaces which cannot be sprayed and that will prevent achievement of a continuous covering of the item shall be covered or filled to provide a surface for the spray-on material.

Contaminated item shall be individually wrapped (double wrapped if surface area is less than 37 m^2 or triple wrapped if surface area is greater than 37 m^2) with the flexible materials with all surfaces and protrusions fully enclosed. The wrapping shall be sealed with reinforced cotton cloth tape and/or heat sealing. Sharp edges and corners shall be padded. Contaminated items shall not extend beyond the trailer dimensions, side or end(s) overhang will not be allowed.

Tiedown and blocking/bracing operations shall be in accordance with the provisions of the U.S. Department of Transportation (DOT) Motor Carrier Safety Regulations.

Oversize material transfer shall not take place when ambient temperatures are below 0°F, when the surface temperature of the outer packaging exceeds vendor specifications, when visibility is impaired by fog, rain, snow, or dust, or when wind speed exceeds 15 mph.

SUBCONTRACTOR shall inspect each package prior to transfer and document it is in accordance with Subcontract Documents. If packaging does not meet requirements SUBCONTRACTOR shall repackage oversize objects until requirements have been met.

3.1.8 Backfilling of Excavations

3.1.8.1 Waste Site and Pipe Trench Backfill

Waste site and pipe trench excavations shall be backfilled with approved backfill materials and contoured, as shown on the project drawings. Site restoration at waste sites shall be limited to backfilling and shall not include revegetation. For excavations greater than or equal to 4.57 m in depth, contaminated soil may be left in place (consistent with clean-up requirements), that may require radiological controls. For these situations, SUBCONTRACTOR shall operate equipment on uncontaminated backfill.

3.1.8.2 Compaction

Backfill shall be placed and compacted in accordance with Metric units of WSDOT M41-10, 2-03.3(14)C, "Compacting Earth Embankments," Method A or approved equal method.

3.2 MISCELLANEOUS FIELD SERVICES

3.2.1 Moisture and Dust Control

No visible dust will be allowed; dust shall be controlled by water spraying or other approved methods. The active excavation face(s) shall receive dust control measures during excavation operations, such as misting spray application of water during operations. The active excavation face(s) shall receive positive dust control measures other than water alone, such as non-regulated soil fixants (Soil Sement™ or CONTRACTOR approved equivalent), or penetrating crusting agents (magnesium chloride or CONTRACTOR approved equivalent) at the end of each shift. Positive dust control measures are also required immediately after excavation activities are shut down due to excessive winds (8.9 m/s). Contaminated or potentially contaminated stockpiles that will be inactive for periods of greater than 24 hours shall also receive positive dust control measures other than water alone. Dust suppressant application equipment shall be provided at no

additional expense to the CONTRACTOR. Upon approval, conditions may allow use of recycled water.

Dust from excavation and haul operations shall be controlled through engineering and administrative controls. Controlled locations include, but are not limited to, the limits of waste site excavations and access ramps, roads, parking areas, the Container Transfer Facility, and storage areas. The Container Transfer Facility and haul roads shall receive positive dust control measures other than water alone, that are penetrating and long lasting, such as penetrating crusting agents (magnesium chloride). Care shall be taken not to produce ponding of any applied material on the surface.

3.2.2 Roads

Maintain roads in accordance with the construction drawings and Subcontract Documents. Decontaminate roadways, as necessary, prior to project completion and systematically scarify entire surface of temporary haul roads to depth of placed material constructed by the SUBCONTRACTOR.

The road surface shall be maintained true to line and grade and cross-section by blading, watering, and rolling crushed surface material.

Existing pavement that becomes loose shall be removed and disposed, as appropriate, and replaced with equal.

Haul roads shall be constructed to provide access for the ERDF haul CONTRACTOR and shall conform to the criteria for ERDF haul vehicles (maximum 8% grade, minimum width of 4.0 m each way, minimum turning radius of 27.4 m). Where there is a potential of underground contamination, excavating will not be permitted in the construction of these haul roads.

For re-route and road improvement/construction, roads shall be bladed smooth, moistened, subgrade compacted, and crushed surfacing material placed to a compacted depth of 150 mm (minimum of 2 compacted lifts). Compaction shall be achieved by a minimum of 3 passes with a 8.16 t static weight vibratory roller with 17.7 t dynamic force. The access road re-routes shall be 6.10 m wide with a maximum grade of 6%, and a minimum turning radius of 18.3 m.

3.2.3 Container Transfer Facility

The Container Transfer Facility shall be constructed to the lines and grades as shown on the project drawings.

SUBCONTRACTOR shall proof roll the subgrade with an 8.16 t static weight vibratory roller for soft spots witnessed by the CONTRACTOR. If any soft spots are found, they shall be excavated and filled with compacted fill material.

Fill material shall be placed in maximum 300 mm lifts and compacted with a minimum of four passes with a 8.16 t static weight vibratory roller with 17.7 t dynamic force.

Crushed Surfacing material shall be placed in 76 mm lifts and compacted with a minimum of three passes with a 8.16 t static weight vibratory roller with 17.7 t dynamic force.

3.2.4 Illumination Requirements

Task lighting (portable light plant, light towers, etc.) for full illumination of the container transfer facility shall be provided and installed in accordance with the manufacturer's recommendations, Illuminating Engineering Society (IES), National Electrical Code (NEC), and OSHA requirements.

Task lighting shall be required in the Container Transfer Facility area to permit delivery and/or pickup of containers during off shift hours (year round) and in the winter months (October – March) to support inventory control of containers.

3.2.5 Backfill for Export Water Line

Backfill with fill material in lifts not to exceed 300 mm in depth. Each lift shall be compacted to 95% relative density (as determined by ASTM D1557). Equipment used to place and compact the backfill shall not be operated within 1.5 m of the pipeline. Hand operated mechanical tampers or vibratory plate compactors shall be used to compact fill adjacent to the pipe. Backfill shall proceed shown on project drawings until the top of the fill is even with the pipe's horizontal centerline (springline). No backfill below the springline elevation shall be placed directly against pipeline. Controlled density fill (CDF) shall be placed in the trough until the CDF is level with the pipes springline. After the CDF has reached 75% of its design strength, backfill above the pipe shall continue. No equipment shall be driven across the pipeline at any time during backfill operations. Only hand operated mechanical compaction equipment shall be used within 1 m of pipe.

3.2.6 Exclusion Fence

Exclusion fence shall be installed where shown on project drawings, attached, and supported with steel posts at 3.0 m intervals.

3.2.7 Material Staging Areas Outside the AOC

Material staging areas (soils, concrete panels, etc), shall be where shown on the construction drawings, or as approved by CONTRACTOR. Materials shall be placed on a 10-mil minimum layer of reinforced plastic and berm the plastic to prevent run-on/run-off of precipitation. The materials staging areas shall be roped or fenced off and "authorized personnel only" signs placed on all sides of area.

3.2.8 Size Reduction Area

Size reduction area(s) shall be located within the AOC and designed to safely perform all size reduction operations. The area(s) shall be bermed to control run on/off and lined with an engineered barrier to prevent cross contamination of the adjacent soils. The engineered barrier shall be designed to prevent cross contamination (penetration or damage to the engineered barrier and control of airborne contamination) based on the SUBCONTRACTOR's size reduction operations.

3.2.9 Water Fill Station

The water fill station shall be connected to a fire hydrant as shown on the project drawings. The connection shall use only the 63 mm (2.5 inch) hydrant outlet with a non-rising-stem gate valve with an 63 mm (2.5 inch) NH female inlet and a 38 mm (1.5 inch) NH male or female outlet. Hydrants shall be opened with a SUBCONTRACTOR supplied, CONTRACTOR approved hydrant wrench. Hydrant and hose shall be depressurized when not in use. Hydrant shall be used in the fully open or fully closed position only.

3.3 QUALITY ASSURANCE/QUALITY CONTROL

Establish and maintain an approved Quality Assurance/Quality Control (QA/QC) Program, in accordance with Exhibit "A," to assure compliance with subcontract requirements and shall maintain records of QC for operations. The program shall describe the system(s) for planning, performing, and assessing work that ensures materials, systems, results, and personnel meet stated quality, technical, and performance objectives. Activities related to Earthwork and Excavated Materials Handling shall conform to stated quality, technical, and performance objectives of the approved QA/QC Program.

4.0 YEAR 2000 WARRANTY

Any computer application or system or equipment provided under this specification shall be Year 2000 Compliant. As used in this warranty, the term "Year 2000 Compliant" means that the

Product, when configured and used according to the documented instructions will without manual intervention or interruption:

a. Correctly handle and process date information before, during, and after January 1, 2000, accepting date input, proving date output and performing calculations, including but not limited to, sorting and sequencing, on dates or portions of dates;

b. Function according to the documentation during and after January 1, 2000, without changes in operation resulting from the advent of the new century;

c. Where appropriate, respond to two-digit date input in a way that resolves any ambiguity as to century in a disclosed, defined, and predetermined manner;

d. Store and provide input of date information in ways that are unambiguous as to century; and

e. Manage the leap year occurring in the year 2000, following the quad-centennial rule. The "quad-centennial rule" means (a) if the year is divisible by 4, it is a leap year, UNLESS (b) the year is also divisible by 100, then it is not a leap year, UNLESS (c) the year is also divisible by 400, then it is a leap year.

Supplemental Waste Acceptance Criteria For Bulk Shipments to the Environmental Restoration Disposal Facility

SUPPLEMENTAL WASTE ACCEPTANCE CRITERIA

FOR BULK SHIPMENTS TO THE

ENVIRONMENTAL RESTORATION DISPOSAL FACILITY

BHI-DIS 7-15-97 KW

REV.	DATE	REASON FOR REVISION	ORIGINATOR	FIELD SUPPORT	RAD ENGINEER	PROJECT ENGINEER
1	7/8/97	Concrete and Rebar Revision				
0	4/14/97	ISSUED FOR PROGRAM-WIDE USE	D. R. Myers	S. Thiesse	S. Dennis	J. Darby

	RICHLAND ENVIRONMENTAL RESTORATION PROJECT	JOB NO. 22192
		CRITERIA NO. 8096X - DC - W0001
		SHEET 1 of 5

SUPPLEMENTAL WASTE ACCEPTANCE CRITERIA FOR BULK SHIPMENTS TO ERDF

Table of Contents

SUPPLEMENTAL WASTE ACCEPTANCE CRITERIA FOR BULK SHIPMENTS TO ERDF

1.0 GENERAL

Waste streams that comply with the ERDF Waste Acceptance Criteria and that meet the supplemental criteria provided in Section 1.0 can be accepted for disposal at ERDF as bulk shipments. Waste streams that comply with the ERDF Waste Acceptance Criteria but do not meet the supplemental criteria will be evaluated on a case-by-case basis for acceptance by ERDF for disposal. The process for the case-by-case evaluation is described in Section 2.0 below.

1.1 RADIOLOGICAL CONTAMINATION LIMITS

The below listed limits are recommendations from Operational Radiological Controls for the protection of the personnel involved in the disposal, spread and compaction of waste at ERDF. These limits are intended to be an extension of the ERDF Waste Acceptance Criteria (WAC).

1. No waste will have a loose (smearable) surface contamination in excess of 100,000 dpm/100cm^2 $\beta\gamma$ or 400 dpm/100cm^2 α when averaged over the entire surface of the material.

2. No waste will have fixed contamination in excess of 75 mRad/hr/100cm^2 $\beta\gamma$ or 80,000 dpm/100cm^2 α when averaged over the entire surface of the material.

3. No waste will have a radiation level reading in excess of 50 mR/hr when measured 30 centimeters from the surface.

1.2 PHYSICAL LIMITS

1.2.1 Concrete Debris

Concrete may be sent to the ERDF in one of two different forms. 1) Reduced to rubble with an maximum dimension of approximately 1 foot. It is perferred that this rubble be mixed with other waste soil so that it can be handled as soil at the ERDF. 2) Large blocks or slabs may be shipped under the following criteria: It must fit inside an RCI container without wedging into the chamferred portion of the container, it must not exceed the gross weight limit for the container (40,000 lb including the container), must not extend above the side walls of the container, shall not exceed 17 feet in length, and must be loaded toward the rear of the box. If the block or slab is wider than the bottom of the container it must be placed in the box in so that it will not become wedged in the chamferred portion of the box. Large blocks of concrete should only be loaded into 700 or 400 series containers ("barn-door" type containers). All rebar must be cut flush with the surface.

1.2.2 Steel Plate

Steel plate shall not exceed 4 ft. in width or 17 ft. in length. Steel plate shall not be bent over or folded to fit in containers and shall be shipped separate from soils in containers to the maximum extent possible.

Steel plates shall not extend above the side walls of the container, and shall not interfere with the tarps placed over the containers, or be loaded in the containers so as to become unstable during loading /unloading operations. Steel plate shall not be forced or pushed into the container in a manner that would inhibit them from sliding out of the container when dumped. Based on field engineering evaluation, cribbing may be necessary to avoid binding of steel plate during unloading.

1.2.3 Piping/Tube Steel

Diameters ≥ 18-in. nominal shall, at a minimum, be split in half and shall be sized less than 17 ft. in length. These pipes shall be nested (placed one length inside the other, with open side up) within the containers to maximize the load without exceeding the 19.3 ton load limit per container. These pipe sections shall not extend above the side walls of the container -- to interfere with the plastic covers and tarps placed over the containers or to become unstable during loading /unloading operations.

Diameters ≥ 2-in. and < 18-in. nominal are not required to be split and may be loaded in lengths up to 17 ft.. Tube steel sections shall have open ends to permit entry of grout.

Diameters < 2-in. nominal may be direct buried at ERDF, may be shipped with split, larger-sized pipe, or metal sheet/plate in lengths up to 17 ft..

Piping with Asbestos Containing Materials (ACM) attached must have all ACM removed from the piping prior to shipping. Also, the ACM must be properly wetted, handled, and packaged as well as shipped separately complying with Section 4.2.2 of the WAC.

1.2.4 Regulated Asbestos Containing Material

Asbestos Containing Materials (ACM), shall be wetted, double-bagged, and shall be shipped separately in RCIE containers or packages provided by the project, complying with Section 4.2.2 of the WAC. Bags shall be limited to a maximum weight of 40 lbs. in order to be handled by an individual worker.

1.2.5 Misc Metals/Building Debris/Structural Steel/Conduit

Any individual piece shall not exceed 4 ft. in width, 2 ft. in depth, or 17 ft. in length. The waste shall not be bent over or folded to fit in containers and shall be shipped separate from soils in containers to the maximum extent possible. The waste shall not extend above the side walls of the container, and shall not interfere with the tarps placed over the containers, or be loaded in the containers so as to become unstable during loading /unloading operations.

1.2.6 Equipment/Containerized (Barrels/Boxes) Waste

Equipment and containerized waste shall meet the requirements of the WAC, shall not exceed the radiological contamination limits of Section 1.1 of this document, and be segregated from the other wastes so that the waste can be placed and compacted with construction equipment to reduce void space for incorporation into the structural fill.

1.2.7 Soft Waste

Soft waste shall meet the requirements of the WAC, not exceed the radiological contamination limits of Section 1.1 of this document, and be segregated from the other wastes so that the soft waste can be spread in thin layers for incorporation into the structural fill.

1.2.8 Rebar

Rebar should be cut to lengths of approximately four feet and mixed with soil to the extent practical. Rebar pieces from D&D projects where soil is not common can be placed in RCI containers with other hard debris.

2.0 SPECIAL HANDLED WASTE

Waste streams that comply with the ERDF Waste Acceptance Criteria, but do not meet the supplemental criteria provided in Section 1.0 will be considered for disposal at ERDF on a case-by-case basis. Items such as the following examples may qualify in this category:

Equipment & Large Pumps
Work Tables
Large Doors
Sludge/Sediment
Aluminum
Piping to be shipped with asbestos attached
Containerized Waste that can not be opened/ruptured during compaction activities at ERDF

The project (waste generator) is responsible for identifying standard waste streams, volume estimates, and generation schedules and forwarding this information to the ERDF Project Engineer in order to initiate joint development of supplemental waste acceptance criteria for the project's special handled waste.

Specific information on waste stream will be size, level of contamination, material, void space, compactability, and quantity of material will also be provided by the project (waste generator). This information will be provided to the ERDF Project Engineer in writing and will be evaluated to determine additional waste preparation and packaging requirements.

SITE-SPECIFIC INSTRUCTION

FOR

SHIPPING TROUGH SECTIONS USING FLEXABLE MATERIAL PACKAGING

100-NR-1 OPERABLE UNIT HANFORD SITE RICHLAND, WASHINGTON

0	October 20, 2000	L. E. Ivey	J. D. Fancher	E. L. Adamson	J. M. Atwood	R. L. Donahoe
REV.	DATE	ORIGINATOR	REVIEWER	QA	TRANSPORTATION MANAGER	TASK LEAD

1.0 PURPOSE

The purpose of this Site Specific Instruction is to assist the project in the implementation of BHI-EE-10, Section 4.0, *Waste Management Plan* and BHI-EE-12, *Packaging Hazardous Materials for Transportation* and to define the specific requirements for shipment of oversized objects using flexible materials for packaging associated with the 100 NR–1 Remedial Action excavation.

2.0 REGULATORY BASIS

Remediation of the 100-NR-1 radioactive waste sites (116-N-1, 116-N-3 and UPR-100-N-31) will remove low-level radioactive waste that will be disposed in the Environmental Restoration Waste Disposal Facility (ERDF). Certain trough sections that cannot fit into standard ERDF roll on roll off containers will be packaged using flexible materials packaging (FMP). Packaging and shipment of the waste must meet DOT and DOE requirements.

Regulations that may apply to the transportation of these trough sections can be found in the following Federal and state regulations: 40 Code of Federal Regulations [CFR], *Washington Administrative Code* [WAC] 173-303, the Revised Code of Washington [RCW] Title 46, Motor Vehicles and in U.S. Department of Transportation (DOT) 49 CFR. Additionally, the U.S. Department of Energy (DOE) Order 1540.1 (*Materials Transportation and Traffic Management*) establishes the policies and procedures governing transportation activities. Administrative procedures to certify and use radioactive and other hazardous materials packaging are identified in DOE Order 1540.2 C-1, *Hazardous Material Packaging for Transport-Administrative Procedures.* Safety requirements to package and transport hazardous materials, substances, and waste are mandated in DOE Order 5480.3. The BHI-EE-12, *Packaging Hazardous Materials for Transportation*, Section 2.0, "Packaging Hazardous Materials For Transportation" contains implementing procedures for packaging all onsite shipments of regulated materials.

Waste Management Technical Services has prepared a evaluation of the shielding, structural, thermal, containment, risk, dose consequence, limits on radioactive isotopes, and tiedown systems (FH, 2000). Elements of that evaluation are applicable to this SSI. The tiedown system evaluation is presented in Appendix A.

3.0 DESCRIPTION

The FMP is used for the onsite transfer of trough sections to the designated disposal facility. The FMP is authorized when use of other packaging cannot be considered operationally practical and/or cannot be economically justified. The package consists of two or more layers of flexible material (4-mil minimum thickness for each layer) wrapped and sealed around the radioactively contaminated item. Dimensions and

configuration of the FMP will vary based on the item(s) to be wrapped. Padding of sharp edges and corners of the item is done to prevent puncture or stressing of the FMP. Closure of the layers of flexible material used to wrap the item is accomplished by either taping/horsetailing with reinforced cotton cloth tape or approved equivalent, or heat sealing. The package is loaded onto a truck-trailer combination and transferred to the designated storage or disposal area.

4.0 REQUIREMENTS

4.1 Materials Requirements

4.1.1 Packaging

The flexible materials authorized for FMP usage are PERMALON X100 FR, GRIFFOLYN T-55 TR, LORETEX 2000/2000 FR-6, LORETEX 3000/3000 FR-7, and vinyl laminated cloth meeting military specification MIL-C-43006G, Types I and II, Class 1. The flexible material shall meet the vendor's specifications, which includes a 4-mil minimum thickness for each layer.

4.1.2 Tiedown Devices

Tiedown Assemblies. Chains used as a component of a tiedown assembly must conform, as a minimum, to the requirements of the June 15, 1990 edition of the National Chain Manufacturers' Welded Steel Chain Specifications, applicable to all types of chain. Chains should also be tagged or labeled to indicate that it conforms to all applicable requirements.

Load binders and hardware. The strength of the load binders and hardware that are part of, or used in conjunction with, the tiedown assembly must be equal to, or greater than, the minimum strength specified for the tiedown assembly.

Attachments to the vehicle. The hook, bolt, weld, or other connector by which the tiedown assembly is attached to the vehicle, and the mounting place and means of mounting the connector, must be at least as strong as the tiedown assembly when that connector is loaded in any direction in which the tiedown assembly may load it.

Winches or other fastenings. The anchorages of a winch or other fastening device mounted on a vehicle and used in conjunction with the tiedown assembly must have a combined tensile strength equal to, or greater than, the strength of the tiedown assembly.

Adjustability. The tiedown assembly and its associated connectors and attachment devices must be designed, constructed, and maintained so that the driver of the vehicle can tighten them.

4.1.3 Blocking and Bracing Components

Blocking and Bracing. A 6 x 17.5 S beam (AISC), laid on its minor axis in the form of an H beam, with 1/2 in. thick by 7 in. wide by 8 in. tall plates welded on each side of the beam, will be used. 1/4 in. fillet welds, located up both outsides and across each side of the S beam web, will be used to weld the beam to the plates. Use A-36 carbon steel plate with an allowable weld stress of 13600 psi.

4.2 Content Requirements

4.2.1 Radiological Requirements

The radionuclide inventory on the transfer vehicle shall be limited up through and including Type B, shall be fissile excepted per 49 CFR 173.453, shall be nontransuranic (<100 nCi/g of waste matrix) per DOE manual 435.1-1, and shall be less than a Highway Route Controlled Quantity per 49 CFR 173.403. An evaluation of the radionuclide inventory has been preformed by Waste Management Technical Services (FH, 2000). A review of this evaluation shall be performed by the WTS and documented according to BHI-EE-12.

4.2.2 Radioactive Concrete Sections

Radioactive concrete sections refer to trough sections removed from the 116-N-3 Crib that will not be shipped inside an ERDF container.

4.3 Transportation Requirements

Environmental. Transfer shall not take place at temperatures below -17.8 °C (0 °F) or when wind speed exceeds 15 mph. The maximum surface temperature of the wrapped item shall not exceed the temperature ranges stated by the FMP manufacturer. Per the discretion the BHI Waste Shipper, visibility impairment caused by fog, rain, snow, or dust may hold transfer.

Radiation limitations. The radiation level on the external surface of the FMP shall not exceed 200 mrem/h excepting one side and bottom may have "hot spots" up to 1,000 mrem/h. "Hot spots" may be identified with labeling and marking showing radiation level. The radiation level at 2 m shall not exceed 10 mrem/h. The dose rate to the driver shall not exceed 2 mrem/h. Shielding may be provided on the transfer vehicle to reduce the exposure level to the driver.

Contamination Limitations. Removable contamination on the external surfaces of the flexible material shall be checked to ensure the following limits are not exceeded: 1,000 dpm/100 cm^2 for beta/gamma emitting isotopes, and 20 dpm/100 cm^2 for alpha emitting isotopes.

Routing. The transfer route shall be controlled to preclude public access during the transfer.

Exclusive use. The transfer vehicle shall be exclusive use and shall not carry any other package containing hazardous material during FMP transfer. Direction regarding route of travel and speed considerations shall also be provided.

Vehicle bed size. The transfer vehicle bed must be of specific dimensions to allow the wrapped trough sections to fit properly and not overhang on the end or sides.

5.0 INSPECTIONS

5.1 Pre-Use Inspections

Pre-use inspections shall be performed before each use of the FMP. Inspections to be completed, prior to each use, include:

1. BHI shippers and FWEC shall ensure the packaging described in section 4.1.1 meets acceptance criteria. The flexible materials used for the package shall be in unimpaired condition (no tears, no punctures, or stretched areas, and has not been subjected to adverse environmental conditions).

2. BHI shippers and FWEC shall visually inspect the item to be packaged to identify and correct protrusions or other conditions that could adversely affect the, structural integrity, packaging, or tiedown.

3. FWEC shall ensure the tie-down equipment meets specification and acceptance criteria.

4. FWEC shall ensure the blocking meets specification and acceptance criteria.

5. FWEC shall ensure the bracing plate meets specification and acceptance criteria.

5.2 Pre-Loading Inspections

1. If the trough is packaged before it is loaded, then after packaging RadCon shall inspect the FMP to verify it maintains containment.

2. If the trough is packaged before it is loaded, then after packaging the BHI shipper shall verify the package is properly sealed.

3. The trailer deck, wood timbers, mat, and bottom of the package shall be inspected to ensure they are clean, dry, and free of any debris or surface oil.

5.3 Pre-Shipment Inspections

1. BHI shipper and FWEC shall inspect the load to assure that there is no evidence of tears, breaching, cracking, oxidation, embrittlement, leakage, or other effects encountered during loading, from adverse weather conditions, or from chemical reactions.

2. The BHI shipper and FWEC will inspection the dunage, cribbing, mats, chains, and bracing to ensure they are properly placed.

3. The BHI shipper and FWEC will independently verify that each FMP layer is properly sealed.

4. A minimum amount of space should be left between the FM and the surface of the trough sections

5. The BHI shipper and FWEC will independently verify that the FMP is properly tied down.

6. The BHI shipper shall ensure tiedowns are taut but not effecting the FMP or having the potential to tear the FMP during transport.

7. BHI shipper will ensure the packages are conspicuously and durably marked as required by DOT and that shipping papers are properly completed.

8. BHI RadCon will document contamination levels and external dose rates.

9. The BHI shipper and FWEC shall ensure the item is properly wrapped with flexible material.

10. The BHI shipper shall inspect the FMP for signs of deterioration, puncturing, breaching, or damage.

11. The load shall be inspected thoroughly by the shipper and carrier prior to release of the shipment. The shipper should ensure that the carrier recognizes his or her responsibility to check the tiedowns periodically during transit, and tighten them as necessary.

6.0 OPERATING PROCEDURES

6.1 Tiedown System

The analysis for the BHI tiedown system assumes a worst-case package that is rectangular with a length of 24 ft and a weight of 80,000 lb. In accordance with the current regulations stated in 49 CFR 393.100, the tiedown system must be sized for a working load limit (WLL) of 0.5 times the gross weight of the package, or in this case, a

maximum of 40,000 lb. The conveyance in this case shall be an 8 ft drop deck trailer equipped with D-rings having a WLL of 15,600 lb for each D-ring.

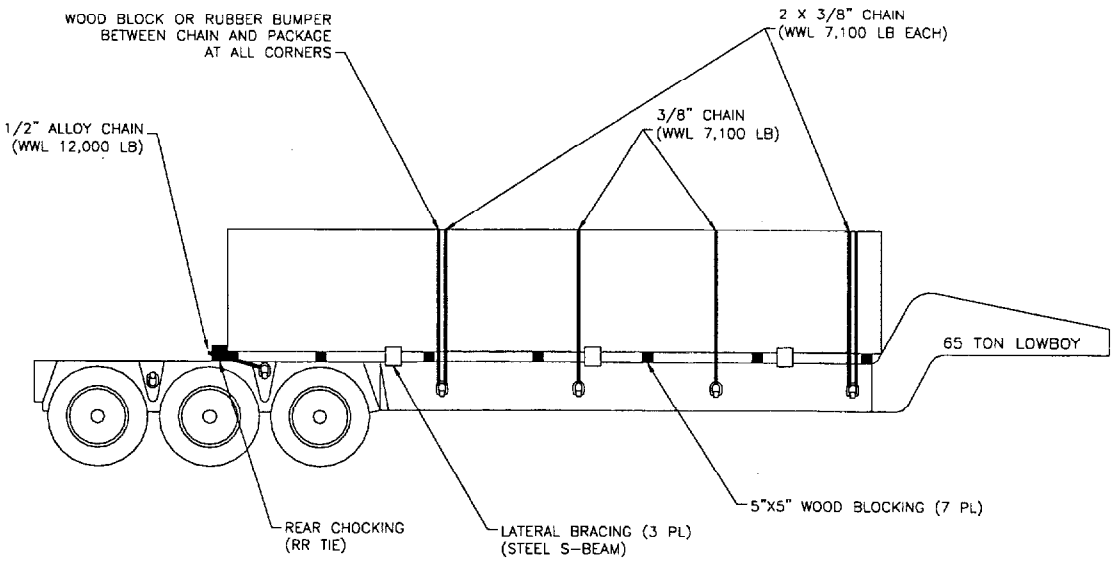
The configuration of the trough tiedown is shown in Figures 1 through 3. The following are the requirements for the tiedown of the package. In all cases, the chains are assumed to wrap all the way around from one D-ring to the matching D-ring on the opposite side of the trailer. To hold the package in the vertical direction, the four D-rings toward the front of the trailer shall be used. There shall be two 3/8 in. chains (with a WLL of 7,100 lb each) in each of the first and fourth D-rings, and one 3/8 in. chain each for the other two D-rings located in the middle. A block of wood or a rubber bumper shall be placed between each chain and the package to prevent the possibility of damage to the flexible material wrapping.

For blocking and bracing, a 6x17.5 S beam, laid on its minor axis in the form of an H beam, with 1/2 in. thick by 7 in. wide by 8 in. tall plates welded on each side of the beam, will be used. 1/4 in. fillet welds, located up both outsides and across each side of the S beam web, will be used to weld the beam to the plates. In total, there will be three beams, which will be braced on each side against the package with wood blocks. The S beam will be blocked in the fore and aft directions by 2x4 chock blocks manufactured from commercial grade lumber nailed to the deck of the conveyance to prevent shifting of the beams. In addition, wood shall be placed between the S beam and the package on the underside to protect the package wrapping. Wood shall be placed between the S beam and the package on the underside to protect the package wrapping. Shims shall be used as necessary between the S beam and deck of the trailer, such that the S beam fits tightly to the trailer deck. The package will be set on 5x5 timbers in sufficient number to support the load without crushing of the timbers or damaging of the package.

There shall also be an additional chain located at the rear of the package. This chock chain shall be used for rearward restraint of the package. The second to last D-ring located at the back of the trailer will be used as an attachment point. The appropriate chain size is 1/2 in. with a WLL of 12,000 lb. However, in place of a 1/2 in. chain, two 3/8 in. chains with a WLL of 7,100 lb each may be used. Wood cribbing the width of the package and at a height of 2 in. to 3 in. above the timbers shall be nailed to a railroad tie. The chain shall lie between the wood and railroad tie or wood timber approximately 8 in. x 8 in. x 8 ft long to protect the package.

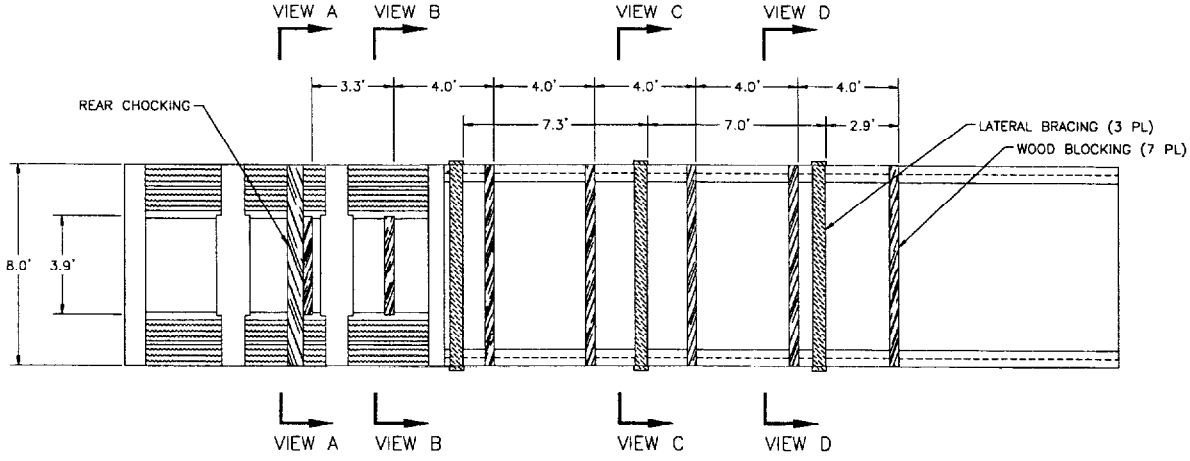
The package shall be placed on a commercial load mat, or at a minimum, a 0.64 cm (1/4 in.) rubber load pad. The mat or pad shall be placed between the bottom of the package and the timbers. Also, the mat or pad shall be placed between the timbers and the deck of the trailer. These mats or pads are used to increase the friction between the package and timbers and timbers and trailer deck. Consequently, the trailer deck, wood timbers, mat, and bottom of the package shall be clean, dry, and free of any debris or surface oil.

Figure 1. Side View of BHI Tiedown.



SIDE VIEW (TIEDOWNS)

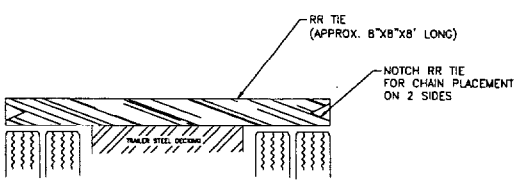
Figure 2. Top View of BHI Tiedown.



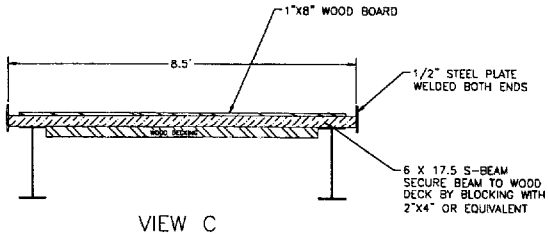
TOP VIEW (BLOCKING)

DIMENSIONS ARE APPROXIMATE

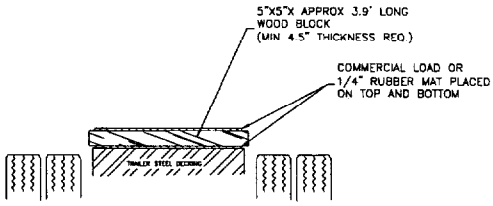
Figure 3. Individual Views of BHI Tiedown.



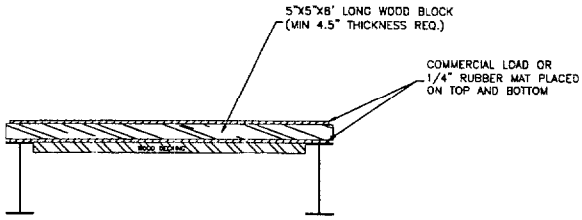
VIEW A
(END CHOCKING)



VIEW C
(LATERAL BRACING)



VIEW B
(BLOCKING NEAR WHEELS)



VIEW D
(WOOD BLOCKING)

6.1.1 Packaging, Tiedown, and Blocking and Bracing Requirements

Depending on conditions, the trough section can be wrapped prior to or after loading. Therefore, the following requirements should be completed as necessary.

6.1.1.1 Pre-Use Requirements

1. The trough section should be visually inspected for damage that could affect structural integrity during the course of transportation.

2. Exposure of the tiedown components to dirt, weather extremes, water, or corrosives may reduce their strength, so these conditions should be avoided, if possible. Use caution to avoid kinking, crimping, or splaying chain, unless a documented rating of the strength can be established by test following the repair.

6.1.1.2 Packaging Requirements

1. Sharp edges and corners on the trough sections should be padded to ensure the flexible material is not damaged.

2. The package will be wrapped with the 4-mil minimum thickness of flexible material at least two times if the total surface area is less than 400 ft^2 or at least three times if the total surface area is greater than 400 ft^2.

3. A minimum amount of space should be left between the FM and the surface of the trough sections.

4. Reinforced cotton cloth tape or heat sealing should be used to seal the flexible material. Each individual FMP layer will be sealed.

6.1.1.3 Pre-Loading Requirements

1. Nails which hold the blocking to the decking shall be driven at right angles to the decking and staggered 2 inches apart. Nail holes shall be predrilled. At a minimum, blocking shall be constructed from 2 x 4 dimensional grade lumber. As a minimum, 10 d common nails shall be used.

2. The trough shall have had liquids drained, as much as practical. Absorbents may be used to absorb residual liquids. No free liquids are allowed.

6.1.1.4 Pre-Shipping Requirements

1. Tiedowns or other restraining devices shall be padded or cribbed as necessary at contact points on the FMP to preclude the possibility of the flexible material being torn.

2. Flexible tiedowns should be free from contact with any other stationary objects when taut to prevent chafing and damage during transfer.

3. The load shall be inspected thoroughly by the shipper and carrier prior to release of the shipment. The shipper should ensure that the carrier recognizes his or her responsibility to check the tiedowns periodically during transit, and tighten them as necessary.

6.2 Loading Procedure

1. The FMP shall be lifted onto the transfer vehicle using the lifting plan. To prevent tearing of the flexible material, the sling shall be padded if the trough section is wrapped prior to lifting.

2. Prior to transfer, if the FMP shows any signs of deterioration or damage (due to loading), the package shall be over-wrapped in new flexible material or the breach be fixed using cloth reinforced tape.

3. If excessive loose material is present efforts will be made to remove loose material prior to wrapping with flexible material. As much as practical, liquids drained as much as practical. Absorbents may be used to absorb residual liquids.

4. FMP needs to be protected from sharp edges, corners, chafing, rubbing, and stress with padding or otherwise protected to prevent damage to the FMP from surfaces that could damage the integrity of the FMP.

6.3 Shipping Procedure

1. The BHI shipper shall review radiation levels as communicated by RadCon for both dose and removable contamination. Evaluate the levels against the limits allowed.

2. BHI shipping should ensure packages are conspicuously and durably marked as required by DOT.

3. The BHI shipper shall ensure shipping papers are signed.

4. The BHI STR shall ensure procedures are properly completed.

5. BHI shipper should check that required driver qualifications and documented training has been completed, per DOT.

6. RadCon should verify the FMP maintains containment. Radiation dose rates and contamination levels from the package, shall be checked to ensure all applicable radiological limits are not exceeded, prior to transportation.

7.0 QUALITY ASSURANCE

These requirements apply to the procurement, fabrication, inspection, testing, utilization, activities that could affect the quality of the packaging and associated hardware. The requirements are taken from the following documents: BHI QA manual requirements and the FWEC QA plan:

- BHI-QA-01, *ERC Quality Program.*
- Construction Quality Assurance/Control Plan for 116-N-3 Crib Demolition and Excavation, 100N-SC-G0058-2-008-07A, Foster Wheeler Environmental Corporation.

BHI QA shall inspect all aspects related to this SSI as deemed approproate.

FWENC QA shall review and approve all purchase requisitions and specifications for materials associated with the FMP, sealing devices, tie-down equipment or other specific components called out by in this SSI and inspect materials prior to use.

FWEC QA shall verify that the quality that of items to be fabricated (including welding) in support of the shipping of oversize sections is performed by qualified personnel using applicable approved procedures.

FWEC QA shall develop checklists for use in their inspection of materials used in, and the packaging of, objects described in this SSI.

8.0 FORMS

All documents used to perform and/or verify quality-related activities shall be controlled. Controlled documents include (but are not limited to) plans, inspection and testing procedures if any), reports, quality verification reports, nonconformance and corrective action reports, this SSI, and operational and maintenance procedures. A copy of these documents shall be maintained at Document and Information Services (DIS), as necessary.

All QA records associated with the FMP shall be retained for 5 years. All lifetime storage QA records required for the FMP shall be stored with the user depending on the purpose of the document. QA records include (but are not limited to) shipping paperwork, onsite waste tracking form (OWTF), and exclusive use statements.

9.0 REFERENCES

40 CFR 263, "Standards Applicable to Transporters of Hazardous Waste," *Code of Federal Regulations*, as amended.

49 CFR 171, "General Information, Regulations, and Definitions," *Code of Federal Regulations*, as amended.

49 CFR 172, "Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements," *Code of Federal Regulations*, as amended.

49 CFR 173, "Shippers--General Requirements for Shipments and Packagings," *Code of Federal Regulations*, as amended.

49 CFR 177, "Carriage by Public Highway," *Code of Federal Regulations*, as amended.

Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), 42 U.S.C. 9601, et seq.

Resource Conservation and Recovery Act of 1976 (RCRA), 42 U.S.C. 6901, et seq.

WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code*, as amended.

BHI-EE-10, *Waste Management Plan*, Section 4.0, "Waste Shipping and Documentation," Bechtel Hanford, Inc., Richland, Washington.

BHI-EE-12, *ERC Transportation Manual*, Procedure 3.0, "Packaging Hazardous Materials for Transportation," Bechtel Hanford, Inc., Richland, Washington.

BHI-FS-03, *Field Support Waste Management Instructions*, Procedure W-005, "Nonhazardous Solid Waste Disposal," Bechtel Hanford, Inc., Richland, Washington.

BHI-QA-01, *ERC Quality Program*, Bechtel Hanford, Inc., Richland, Washington.

DOE Order 1540.1 *Materials Transportation and Traffic Management*, U.S. Department of Energy, Washington, D.C.

DOE Order 1540.2, *Hazardous Material Packaging for Transport-Administrative Procedures*, U.S. Department of Energy, Washington, D.C.

DOE Order 5480.3, *Safety Requirements for the Packaging and Transportation of Hazardous Materials, Hazardous Substances, and Hazardous Wastes*, U.S. Department of Energy, Washington, D.C.

Fluor Hanford, 2000, *Safety Analysis Report for Packaging*, HNF-SD-TP-SARP-007, Rev. 1, Fluor Hanford, Richland, Washington.

RCW 46, *Motor Vehicles*.

Waste Management Technical Services, 2000, *BHI Tiedown Evaluation*, Waste Management Technical Services, Richland, Washington.

Attachments

Attachment A

WM Technical Services *BHI Tiedown Evaluation*

ENGINEERING SAFETY EVALUATION

Subject:	BHI Tiedown Evaluation	**Page:**	1 of 8
Preparer:	LM Hay	**Date:**	08/15/00
Checker:	SS Shiraga	**Date:**	08/16/00

1.0 OBJECTIVE

The objective of this analysis is to determine the tiedown configuration for the FMP.

2.0 REFERENCES

AISC, 1989, *Manual of Steel Construction Allowable Stress Design*, Ninth Edition, American Institute of Steel Construction, Inc., Chicago, Illinois.

Fancher, J. D., 2000, *Final Information Regarding the Revision of the Safety Analysis Report for Packaging for Shipment of 100-N Area Materials; Subcontract No. 0150X-SC-G5009*, (letter to R. VanWormer, dated July 3), Bechtel Hanford, Inc., Richland, Washington.

Hall, Jr., Allen S., Alfred R. Holowenko, and Herman G. Laughlin, 1961, *Schaum's Outline of Theory and Problems of Machine Design*, Schaum's Outline Series, McGraw-Hill Book Company, New York, New York.

Roark, Raymond J., 1965, *Formulas for Stress and Strain*, Fourth Edition, McGraw-Hill Book Company, New York, New York.

3.0 ASSUMPTIONS, RESULTS, AND CONCLUSIONS

The following assumptions were made for this evaluation:

- The worst-case package is rectangular with a length of 24 ft and a weight of 80,000 lb.
- The coefficient of friction is assumed to be 0.4. Therefore, a commercial load or rubber (1/4 in. thick) mat will be placed on the bed of the trailer.
- The working load limit (WLL) of each D-ring, in accordance with the analysis completed by Foster Wheeler (Fancher 2000), is 15,600 lb.
- The trailer width carrying the FMP is an 8 ft drop deck trailer.

- The trailer deck, wood timbers, and bottom of payload must be clean, dry, and free of oil and debris.

- For blocking and bracing, a 6x17.5 S beam with a plate 1/2 in. thick by 7 in. wide by 8 in. tall is welded to an 8 ft, 3 in. beam on each side.

- The chains are all assumed to wrap all the way around from one D-ring to the matching D-ring on the opposite side of the trailer.

The aggregate strength of the tiedowns for this package has to be 1/2 the weight of the package. Therefore, in the vertical direction, the total force on the package is 40,000 lb, and in the horizontal direction (with friction added in) is 8,000 lbf.

The total force in the vertical direction was found to be 41,238 lbf. The number of chains to hold the package in the vertical direction was determined from this force and found to be 6. The chains are Spectrum 8, 3/8 in., with a WLL of 7,100 lb each. These 6 chains will be attached in the following manner:

- Only the 4 D-rings toward the front of the trailer will be used.

- Two chains each will be placed in the first and last D-ring.

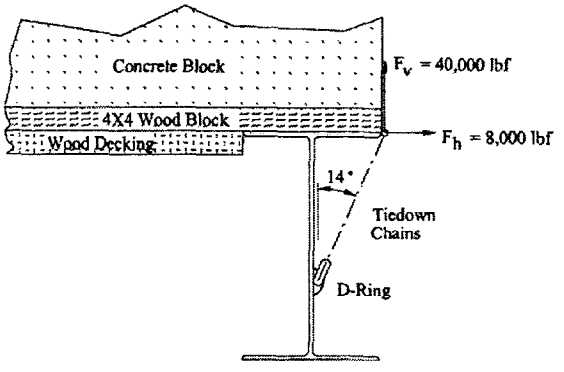
- One chain each will be placed in the two D-rings in the middle between the first and last D-rings.

- A block of wood or rubber bumper shall be placed between each chain and the package to prevent the possibility of damage to the flexible material.

Because of the high force value (167,697 lbf without friction) in the horizontal direction, blocking and bracing must be used. A 6x17.5 S beam with a plate 1/2 in. thick by 7 in. wide by 8 in. tall shall be welded on each side of a beam measuring 8 ft, 3 in. 1/4 in. fillet welds, located up both outsides and down each middle, will be used for the beam. In total, there will be three beams.

There shall also be an additional chain located at the back of the package. The second to last D-ring located at the back of the trailer will be used. The force in the horizontal direction was found to be 8,182 lbf. Spectrum 8 alloy chain will be used. The appropriate chain size is 1/2 in. with a WLL of 12,000 lb. However, in place of 1/2 in. chain, two 3/8 in. chains with a WLL of 7,100 lb each may be used. Wood cribbing the length of the package and at a height of 1 in. to 2 in. above the timbers against the payload shall be placed between the chain and the package.

Figure 1.



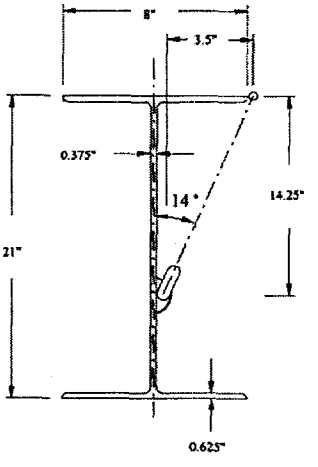
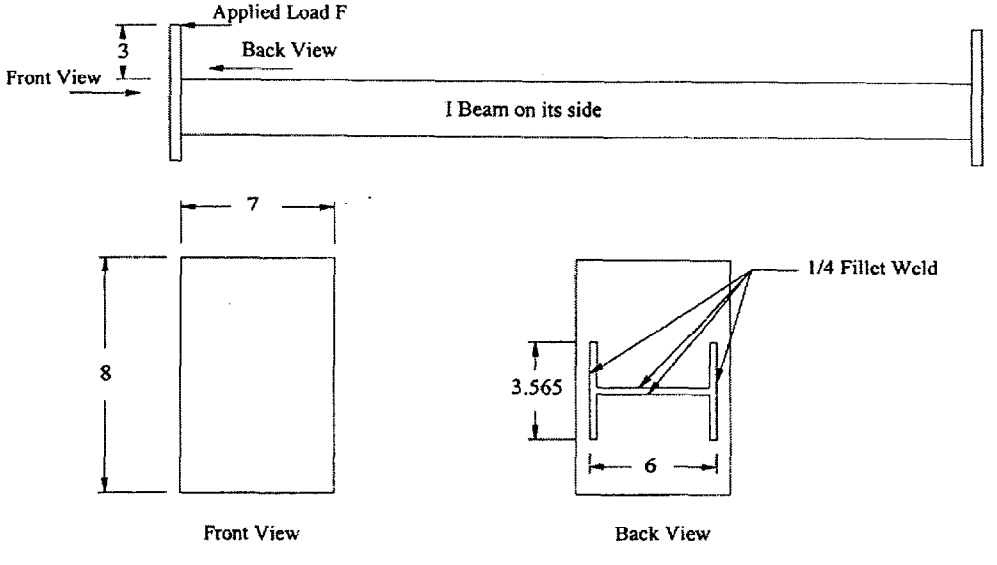


Figure 2.



4.0 EVALUATION

BHI Tiedown

Chains Over Package :

Assume a rectangular package with a length of 24 ft and a weight of 76,980 lb (assume 80,000 lb).

$$length := 24 \cdot ft \qquad weight := 80000 \cdot lbf$$

coefficient of friction with commercial load mats or rubber mat: $\mu := 0.4$

Aggregate strength of the tiedowns has to be 1/2 the weight of the package.

DOT load factor: $g_{load} := 0.5$

Total force on the package:

vertical: $F_v := g_{load} \cdot weight$ $F_v = 40000 \cdot lbf$

horizontal: $F_h := (g_{load} - \mu) \cdot weight$ $F_h = 8000 \cdot lbf$

It is assumed the chain wraps all the way around from one D-ring to the one on the opposite side of the trailer.

Loading will be considered in the vertical direction (F_v) and the horizontal direction (F_h) separately. The load on the chain will be determined for each case.

First consider force in the vertical direction (F_v). Determine the angle the chain is at on the sketch shown above.

$$\alpha := \operatorname{atan}\left(\frac{3.5 \cdot in}{14.25 \cdot in}\right) \qquad \alpha = 14 \cdot deg$$

To find the total force in the vertical direction:

$$F_{tv} := \frac{F_v}{\cos(\alpha)} \qquad F_{tv} = 41189 \cdot lbf$$

Determine number of chains using Crosy (1994). Use Spectrum 8 alloy chain. Chain size will be 3/8 in. with a working load limit (WLL) of 7100 lb. [Note: Proof loaded at 2.5 times WLL. Minimum ultimate load 4 times WLL. The working limits on the D-rings are noted in the Foster Wheeler analysis as being 15,600 lb.]

$$Chain_1 := \frac{F_{tv}}{7100 \cdot lbf} \qquad Chain_1 = 6$$

Therefore, 6, 3/8 in. chains will be used.

To find the total force in the horizontal direction:

$$F_{th} := \frac{g_{load} \cdot weight}{\sin(\alpha)} \qquad F_{th} = 167697 \cdot lbf$$

Because of the force in the horizontal direction, blocking and bracing will have to be used and friction must be considered.

Blocking and Bracing :

Assume a 6 x 17.5 S beam 8 ft, 3 in. long with a plate 1/2 in. thick by 7 in. wide by 8 in. tall welded on each side. Assume welds are 1/4 in. fillet welds, up both outsides and down each middle.

To find 1/2 the plate load:

$$F := (0.5 - \mu) \cdot weight \qquad F = 8000 \cdot lbf$$

Assume the load is out at a tip distance of 3 in. from the beam. Use Roark Fourth Edition to find the stress (p. 135).

central area over with load is distributed: $c := 3 \cdot in$

width of plate: $z := 7 \cdot in$ vertical length of plate: $a := 3 \cdot in$

Due to the bending stress, assume 3 - 6 x 17.5 S blocking and bracing beams will be used.

For K_m and K_y: $\frac{z}{a} = 2.3$ $\frac{c}{a} = 1$

Therefore: $K_m := 0.040$ and $K_y := 0.052$

thickness: $t := 0.5 \cdot in$

Bending stress is:

$$s := K_m \cdot \left(\frac{6 \cdot \frac{F}{3}}{t^2} \right) \qquad s = 2.6 \cdot ksi$$

The bending stress has to be less than 1/3 of the yield strength of the A-36 carbon steel plate.

$$A36 := \frac{1}{3} \cdot 36 \cdot ksi \qquad A36 = 12 \cdot ksi$$

elastic modulus for A-36: $E := 29.3 \cdot 10^6 \cdot psi$ Poisson's ratio of A-36: $\nu := 0.29$

$$D := \frac{E \cdot t^3}{12 \cdot \left(1 - \nu^2\right)} \qquad D = 333233.8 \cdot lbf \cdot in$$

Deflection: $$y := K_y \cdot \left(\frac{\frac{F}{3} \cdot a^2}{\pi \cdot D} \right) \qquad y = 0.001192 \cdot in$$

Due to the bending stress, 3 - 6 x 17.5 S beams will be used.

Next, determine if the 1/4 in. fillet welds are adequate for the tiedown using Schaum (Ch. 25).

Dimensions for the 6 x 17.5 S beam (AISC):

web thickness: $wt := 0.465 \cdot in$ flange width: $fw := 3.565 \cdot in$

flange thickness: $f_t := 0.359 \cdot in$

bending moment: $M := \frac{F}{3} \cdot a$ $M = 8000 \cdot lbf \cdot in$

vertical leg section modulus: $Zw_1 := \frac{fw^2}{3}$ $Zw_1 = 4.2 \cdot in^2$

horizontal leg section modulus: $Zw_2 := \left(6 \cdot in - 2 \cdot f_t\right) \cdot wt$ $Zw_2 = 2.5 \cdot in^2$

bending force on weld per in.: $f_w := \frac{M}{Zw_1 + Zw_2}$ $f_w = 1195.4 \cdot \frac{lbf}{in}$

length for one of the weld legs: $WL := (2 \cdot fw) + \left[2 \cdot \left(6 \cdot in - 2 \cdot f_t\right)\right]$ $WL = 17.7 \cdot in$

tensile force per inch: $f_t := \frac{\left(\frac{F}{3}\right)}{WL}$ $f_t = 150.7 \cdot \frac{lbf}{in}$

total force per unit length of weld: $F_{tot} := f_w + f_t$ $F_{tot} = 1346.1 \cdot \frac{lbf}{in}$

Attachment B

BHI Acceptance Checklist (Preliminary)

Item [approver]	Type of Inspection	Acceptance Criteria	Initials
Packaging [BHI shipper]	Visual, prior to packaging	No punctures, tears	
Packaging [BHI QA]	Inspection of FW QA for packaging	Meets criteria specified in this SSI	
S-beam lateral blocking [BHI QA]	Inspection of FW QA for S-beam	Visual, prior to initial use for each S-beam. A 6 x 17.5 S beam (AISC), laid on its minor axis in the form of an H beam, with 1/2 in. thick by 7 in. wide by 8 in. tall plates welded on each side of the beam using A-36 carbon steel plate.	
S-beam welding [BHI-QA]	Inspection of FW QA for S-beam	Visual, prior to initial use for each S-beam. 1/4 in. fillet welds, located up both outsides and across each side of the S beam web	
S-beam welding stress	Inspection of FW QA for S-beam	Inspection of fabricator procedure or methods to ensure an allowable weld stress of 13600 psi.	
Trough is properly wrapped with flexible material [BHI shipper]	Visual – Prior to each shipment	Sharp edges are padded, proper number of layers for size of shipment, all openings are sealed, no punctures, no tears or stretched areas. No free liquids.	
FMP is properly tied down [BHI shipper]	Visual – Prior to each shipment	Tie down scheme is per section 6.1	
Verify acceptance criteria are met. [BHI shipper]	Visual – Prior to each shipment	No overhang on end or sides or trailer.	
Procedures [BHI shipper]	Visual – Prior to shipping	Procedures have been properly completed. Inspections have been signed off.	
Load [BHI Shipper]	Visual – Prior to shipping	Inspect the contaminated item for damage that could affect tiedown.	

Attachment C

Points of Contact

Title	PRIMARY CONTACT	SECONDARY CONTACT
ERC Project Management 100 N Remedial Action	Rick Donahoe 373-6230	Ernie Mokuiki 373-6894; 531-0600
Radiological Control Engineering	Steve DeMers 531-0729	Rob Sitsler 521-6634
ERC Regulatory Support	Jon Fancher 373-9123; 531-0700	Fred Roeck 372-9086
Waste Transportation Specialist	Patty Newman 373-2521; 531-0620	Bob Bidstrup 373-3310

EXHIBIT "E"

TECHNICAL SPECIFICATION

FOR

ELECTRICAL MATERIALS AND EQUIPMENT

BHI-DIS 4/19/2000

1	4/13/00	Issued for Construction				
0	12/02/99	Issued for Bid	SAM	CLR	JAG	FMC
REV.	DATE	REASON FOR REVISION	ORIGINATOR	CHECKER	GROUP SUPVR.	PROJ. ENGR./DES
Environmental Excellence HANFORD		RICHLAND ENVIRONMENTAL RESTORATION PROJECT	JOB NO. 22192			
			*SCOPE OF WORK NO. 0100N-SP-E0017			
			SHEET 1 of 12			

TECHNICAL SPECIFICATION

FOR

ELECTRICAL MATERIALS AND EQUIPMENT

TECHNICAL SPECIFICATION
FOR
ELECTRICAL MATERIALS AND EQUIPMENT

1.0 GENERAL

1.1 SUMMARY

This specification establishes quality and workmanship requirements and defines how quality is measured for electrical materials and equipment and in applicable Subcontract requirements. Reference is directed to Exhibit "D," Scope of Work for specific services required.

1.2 ABBREVIATIONS

The abbreviations listed below, as used in this specification, will have the following meanings:

AIC	ampere interrupting capacity
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
AWG	American Wire Gage
DC	direct current
EMT	electrical metallic tubing
FS	Federal Specifications
HEPA	high efficiency particulate air
IES	Illuminating Engineering Society
IMC	intermediate metal conduit
kVA	kilovolt ampere
mA	mili ampere
NEC	*National Electrical Code*
NECA	National Electrical Contractor's Association, Inc.
NEMA	National Electrical Manufacturers Association
NETA	International Electrical Testing Association
NFPA	National Fire Protection Association
PVC	polyvinyl chloride
QA/QC	Quality Assurance/Quality Control
RGS	rigid galvanized steel conduit
UL	Underwriter's Laboratories, Inc.

1.3 CODES, STANDARDS, LAWS, AND REGULATIONS

Unless otherwise approved or shown, the following codes, standards, laws, and regulations of the latest issue at the time of the bid shall apply to establish minimum requirements for electrical materials and equipment. Referenced test methods, specifications, and recommended practices are to be used to verify material properties and identify acceptable practices. Failure to identify applicable codes or standards does not negate the requirement to be knowledgeable of or to comply with applicable codes, standards, laws, and regulations.

ANSI C80.1	Rigid Steel Conduit, Zinc Coated
ANSI Z55.1	Gray Finishes for Industrial Apparatus and Equipment
ASTM A570	Standard Specification for Steel, Sheet, Strip, Carbon, Hot-Rolled, Structural Quality
ASTM 1083	Specification for Zinc-coated (Galvanized) Steel Pipe
ASTM 1184	Specification for Industrial and Commercial Horizontal Slide Gates
FS W-C-596	Connector, Receptacle, Electrical
FS W-C-1094	Conduit and Conduit Fittings
FS W-S-896E	Toggle Switch, Flush Mounted
NECA 5055	Standard of Installation
NEMA 250	Enclosures for Electrical Equipment (1,000 volts Maximum)
NEMA AB 1	Molded Case Circuit Breakers and Molded Case Switches
NEMA FB 1	Fittings, Cast Metal Boxes, and Conduit Bodies
NEMA ICS 2	Industrial Control Devices, Controllers, and Assemblies
NEMA KS 1	Enclosed Switches
NEMA PB 1	Panelboards
NEMA TC 2	Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80)
NEMA TC 3	PVC Fittings for use with PVC Conduit

NEMA WC 3	Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
NEMA WC 5	Thermoplastic Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
NEMA WC 7	Cross-Linked Therosetting Polyethylene Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
NEMA WD 1	General Requirements for Wiring Devices
NFPA 70	National Electrical Code

1.4 TECHNICAL SUBMITTALS

All required submittals stated herein or elsewhere in this specification shall be submitted for review and approval in accordance with EXHIBIT "I," Subcontractor Submittal Requirements Summary (SSRS). Submittals that do not meet the project requirements will be rejected. Rejected submittals shall be resubmitted in a timely manner.

1.4.1 UL Certification

Provide written certification that all materials required by NFPA 70, National Electrical Code, to be listed by a recognized testing laboratory, do conform to their listing and are so labeled.

1.4.2 Shop Drawings

Submit for approval manufacturer's descriptive information for the following items:

- Panelboard data
- Infrared heaters
- Auxiliary heating
- Circuit breakers
- Switches and receptacles
- Interior lighting, including information on low temperature characteristics of ballast
- Exterior lighting, including photocell data
- Vacuum cleaner
- Exhaust fan
- Motorized Gate and Access Control System

1.5 DEFINITIONS

1.5.1 Construction Drawings

Drawings and/or shop drawings supplied by SUBCONTRACTOR and used for construction.

1.5.2 Project Drawings

Drawings supplied by CONTRACTOR and contained in Exhibit "F," Project Drawings.

2.0 MATERIALS AND EQUIPMENT

2.1 GENERAL

The use of a manufacturer's name is intended to establish the type, function, and quality required. Products shall comply with applicable provisions of NFPA 70.

2.2 ELECTRICAL MATERIALS

2.2.1 General

Unless otherwise indicated, provide materials and equipment that are the standard products of manufacturers regularly engaged in the production of such materials and equipment. Provide the manufacturer's latest standard design that conforms to these technical specifications. All electrical work shall be inspected by International Association of Electrical Inspectors certified inspectors to the standards of National Certification Program for Construction Code Inspectors.

2.2.2 Lighting Panel Board

Building branch circuit panel boards shall be circuit breaker type. Panel board enclosure shall be rated NEMA 1. Panel boards and circuit breakers shall be suitable for use with 75°C wire at full NFPA 70, 75° C ampacity. Panel board shall be in conformance with applicable requirements of NEMA PB 1 and NFPA 70. Panel board shall be rated for systems with an available short-circuit current of 25,000 amperes rms symmetrical at 240 volts. The panels shall be provided with typewritten sheet installed inside the door, identifying the use of the branch circuits.

Multi-pole breakers shall automatically open all poles when an overload occurs on one pole.

2.2.3 Conduits

Exposed conduit shall be rigid except for connection to motors or fixtures up to 1 m maximum length. Steel conduit and fittings shall be galvanized and meet the requirements of ANSI C80, NEMA FB 1, UL, and the NEC.

Buried conduit shall be rigid PVC, Schedule 40, UL listed for concrete encased and direct burial. Conduits, couplings, elbows, nipples, and other fittings shall meet the requirements of NEMA TC 2 and TC 3, Federal Specification W-C-1094, UL, NEC, and ASTM specified tests for the intended use.

For connections to equipment, use flexible liquid-tight conduit.

2.2.4 Lighting Fixtures

Provide interior and exterior lighting fixtures, as shown and specified on the project drawings. Provide additional fixtures, as necessary, to accomplish the work.

2.2.5 Receptacles

Provide UL listed, specification grade receptacles meeting NEMA WD 1 performance standards and Federal Specification W-C-596, and having a contact arrangement such that contact is made on two sides of each inserted blade without detent. Receptacles shall be two-pole, three-wire grounding type, rated 20 amps, 125 volts, NEMA Configuration 5-20R with screw type terminals suitable for No. 10 AWG.

Where shown on the project drawings, provide ground fault circuit interrupter type receptacle. Receptacle shall be duplex specification grade, tripping at 5mA and provisions for testing. Receptacle shall be rated at 125 volts, NEMA WD 1, Configuration 5-20R, 20 amps.

2.2.6 Switches

Provide UL listed, specification grade, totally enclosed, ac type, quiet tumbler switches meeting NEMA WD 1 performance standards and capable of control of 100% tungsten filament and fluorescent lamp loads. Use switches rated 20 amps, 120/277 volts. Switches shall have screw terminals and have integral grounding terminal on mounting strap.

2.2.7 Outlet and Device Boxes

Provide boxes not less than 50 mm deep. Do not use box extensions to provide wiring space required by the NEC. Boxes shall be cast metal or sheet steel with gasketed weatherproof covers. Boxes shall be Crouse-Hinds, type FS or FD; Appleton, type FS or FD, or as approved. Non metallic boxes shall be PVC with weatherproof cover and

stainless steel screws. Boxes shall be Carlon, type FS or FD, with type E98 or E96 covers; or as approved.

2.2.8 Cover Plates

Provide plates fitting closely and tightly to the box on which they are to be installed. On surface-mounted boxes, provide plates that do not extend beyond the sides of the box unless the plates do not have sharp corners or edges.
Provide one-piece plate with smooth exterior faces and with oval head mounting screws.

Where weatherproof devices are indicated, provide a gasketed, weatherproof, cast metal, stainless steel or fiberglass (FRP) cover plate with individual cap over each opening, and stainless steel mounting screws. Plates shall have caps held by stainless steel springs.

Plates for receptacles shall be gasketed, cast aluminum, with individual cap over each receptacle opening.

2.2.9 Support and Framing Channels

Support and framing systems shall be constructed of materials specifically manufactured for support of electrical systems and devices. Materials shall be mild strip steel, 12-gauge, ASTM A570, grade33, hot-dip galvanized after fabrication.

System manufacturer shall be B-Line, Unistrut, Aickinstrut, or as approved.

2.2.10 Conductors

Conductors shall conform to applicable requirements of NEMA WC 3, WC 5, and WC 7.

All conductors shall be copper.

Flexible cords and cables shall be Type SOW-A/50 with ethylene propylene rubber insulation.

2.3 EQUIPMENT

2.3.1 Heaters

As shown on project drawings.

2.3.2 Auxiliary Heating

In addition to the infrared work space heaters, provide auxiliary heating to ensure that the temperature of radiological survey instrumentation can be maintained at a minimum temperature of 4.5°C. Interior space heating, in addition to the aforementioned auxiliary

heating, shall be provided for freeze protection within the Survey Station structure. The electrical service that will be provided by the CONTRACTOR to the Survey Station is not adequate to support auxiliary or interior space heating; therefore, it is anticipated that gas-fired heating or other approved systems will be required. It shall be the responsibility of the SUBCONTRACTOR to provide the means and methods, and pay all costs associated with auxiliary and space heating of the Survey Station.

2.3.3 Vacuum Cleaner

Provide one vacuum cleaner for use in the Survey Station. The vacuum cleaner shall be 1490 W minimum, 52 L per second, and capable of a minimum 2,670 mm water lift. The vacuum shall be equipped with a high efficiency particulate air (HEPA) filter capable of removing 99.97% of particulates down to 0.3 microns. The vacuum cleaner must receive a satisfactory D.O.S. efficiency test according to ANSI/American Society of Mechanical Engineers (ASME) ANSI/ASME N510 requirements and have a sticker attached stating such. The vacuum must be tested prior to use, annually, and after maintenance that could affect the seal of the HEPA filter. A test sticker shall be attached after each testing.

2.3.4 Exhaust Fan

Provide ventilation fan and duct work to exhaust truck engine combustion emissions from inside the Survey Station. The fan shall have a minimum capacity of 31 L per second at 1,550 RPM and be capable of continuous service duty.

2.3.5 Motorized Gate

Gate(s) shall be horizontal slide gates conforming to applicable requirements of ASTM F 1184. Gate frame shall conform to strength and coating requirements of ASTM F 1083 for Group IA steel pipe, with external coating Type A, nominal pipe size 40 mm. Gate fabric shall be fabricated of 9 gauge zinc coated steel wire. Fabric shall be twisted and barbed on the top selvage and knuckled on the bottom selvage. Gate height shall match fence height, as shown on the Project Drawings. Gates shall have intermediate members and diagonal truss rods as necessary to provide rigid construction, free from sag or twist. Latches, hinges, stops, rollers, and other hardware items shall be furnished, as required for the operation of the gate.

Electrical gate operators for horizontal sliding gates shall have a right angle gearhead instantly reversing motor (1/2 HP min.) with magnetic drum brake, friction disc clutch, reversing starter with thermal overload protection, and a chain driven geared rotary type limit switch. Positive stops shall be provided on the gate tracks as a backup to the limit switches. Gate operators shall be equipped with an emergency release to allow the gate to be manually operated.

Motorized gate operators shall be controlled with a remote transmitter/receiver. The approved operating system will maintain motorized gates in a normally closed position,

opening only for authorized vehicles or personnel. Supply a minimum of 10 remote gate operator units for use by the CONTRACTOR.

3.0 EXECUTION

3.1 GENERAL

Install materials and equipment in accordance with manufacturer's recommendations and NECA 5055.

3.2 FIXTURE AND EQUIPMENT SUPPORT

Provide hangers, pendants, and canopies, as necessary, for a complete installation. Fixtures and equipment shall be supported independently of conduit by attachment to building structure or specified support and framing channels. Provide additional ceiling bracing, hangar supports, and other structural reinforcements to the structure, as required, to safely mount each item and to provide a complete operational system.

3.3 OUTLET AND DEVICE BOXES

Install suitable for conditions encountered at each outlet or device in wiring or raceway system, sized to meet NFPA 70 requirements. Locations shown on the project drawings are approximate and shall be located to avoid interference with mechanical equipment or structural features.

3.4 JUNCTION AND PULL BOXES

Install where shown and where necessary to terminate, tap-off, or redirect multiple conduit runs. Install in conduit runs at least every 49 m or after the equivalent of three right-angle bends. Use outlet boxes as junction and pull boxes wherever possible and as allowed by applicable codes. Use of conduit bodies as junction and pull boxes is permitted where allowed by applicable codes. Do not use unnecessary splices, nor more splices than allowed by codes for size of box or body.

3.5 VERIFICATION OF COMPLIANCE

Prior to use of electrical materials or equipment, submit written verification that the completed installation complies with the specifications contained in this section, has been tested to fully verify that they function as intended, and that the on site records have been completed.

3.6 QUALITY ASSURANCE/QUALITY CONTROL

Establish and maintain an approved Quality Assurance/Quality Control (QA/QC) Program, in accordance with Exhibit "A," Quality Assurance Program, to assure compliance with Subcontract requirements and shall maintain records of QC for all operations. The program shall describe the system(s) for planning, performing, and assessing work that ensures materials, systems, results, and personnel meet stated quality, technical, and performance objectives. All activities related to surveying and decontamination shall conform to stated quality, technical, and performance objectives of the approved QA Program.

3.7 TESTING

Test all 600V conductor insulating at 1,000 VDC for minimum 50 mega ohms. Replace any conductors not passing test. Testing results shall be submitted to CONTRACTOR.

4.0 CLEAN-UP

All unused material and debris resulting from the work shall be removed following the completion of work. The work area shall be maintained daily in a clean and orderly fashion during construction activities.

5.0 YEAR 2000 WARRANTY

Any computer application or system or equipment provided under this specification shall be Year 2000 Compliant. As used in this warranty, the term "Year 2000 Compliant" means that the Product, when configured and used according to the documented instructions, will without manual intervention or interruption:

a. Correctly handle and process date information before, during, and after January 1, 2000, accepting date input, proving date output, and performing calculations, including, but not limited to, sorting and sequencing, on dates or portions of dates;

b. Function according to the documentation during and after January 1, 2000, without changes in operation resulting from the advent of the new century;

c. Where appropriate, respond to two-digit date input in a way that resolves any ambiguity as to century in a disclosed, defined, and predetermined manner;

d. Store and provide input of date information in ways that are unambiguous as to century; and

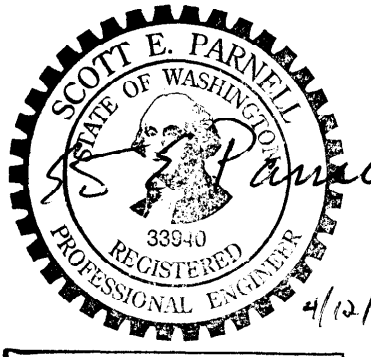
e. Manage the leap year occurring in the year 2000, following the quad-centennial rule. The "quad-centennial rule" means (a) if the year is divisible by 4, it is a leap year, UNLESS (b) the year is also divisible by 100, then it is not a leap year, UNLESS (c) the year is also divisible by 400, then it is a leap year.

EXHIBIT E

TECHNICAL SPECIFICATION

FOR THE

SURVEY STATION



BHI-DIS SEP 4/19/2000

REV.	DATE	REASON FOR REVISION	ORIGINATOR	CHECKER	GROUP SUPVR	PROJECT ENGR/DES
1	4/13/00	Issued for Construction	SEP	KEC	JAG	FMC
0	12/02/99	Issued for Bid	SEP	KEC	JAG	FMC

HANFORD

RICHLAND ENVIRONMENTAL RESTORATION PROJECT

JOB NO. 22192

SPECIFICATION NO. 0100N-SP-M0014

SHEET 1 of 9

TECHNICAL SPECIFICATION

FOR THE

SURVEY STATION

Contents

TECHNICAL SPECIFICATION FOR THE SURVEY STATION

1.0 GENERAL

1.1 SUMMARY

This specification establishes quality and workmanship requirements and defines how quality is measured for the portable Survey Station specified herein and in applicable Subcontract requirements. Reference is directed to Exhibit "D," Scope of Work, for specific services required.

1.2 ABBREVIATIONS

The abbreviations listed below, as used in this specification, shall have the following meanings:

ALARA	as low as reasonably achievable
ASCE	American Society of Civil Engineers
ERDF	Environmental Restoration Disposal Facility
HEPA	High Efficiency Particulate Air
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
PVC	polyvinyl chloride
QA/QC	Quality Assurance/Quality Control
RCT	radiological control technician
SSRS	Subcontractor Submittal Requirements Summary

1.3 CODES, STANDARDS, LAWS, AND REGULATIONS

Unless otherwise approved or shown, the following codes, standards, laws, and regulations of the latest issue at the time of the bid shall apply to establish minimum requirements for the Survey Station. Referenced test methods, specifications, and recommended practices are to be used to verify material properties and identify acceptable practices. Failure to identify applicable codes or standards does not negate the requirement to be knowledgeable of or to comply with applicable codes, standards, laws, and regulations.

ASCE 7	American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures
NFPA 101	Life Safety Code
NFPA 101	National Fire Protection Association
WAC	Washington Administrative Code

1.4 TECHNICAL SUBMITTALS

All required submittals stated herein or elsewhere in this specification shall be submitted to the CONTRACTOR in accordance with Exhibit "I," Subcontractor Submittal Requirements Summary (SSRS). Submittals that do not meet the project requirements will be rejected. Rejected submittals shall be resubmitted in a timely manner.

1.5 DEFINITIONS

1.5.1 Construction Drawings

Drawings and/or shop drawings supplied by SUBCONTRACTOR and used for construction.

1.5.2 Project Drawings

Drawings supplied by CONTRACTOR and contained in Exhibit "F".

2.0 MATERIALS AND EQUIPMENT

2.1 GENERAL

A portable (to be removed at end of project) Survey Station shall be provided for identifying and removing radioactive contamination found on vehicles, containers, equipment, and other items. Attachment 1 provides the standards for release for radioactive shipment and free release that shall be met. For release for shipment, values listed as "Removable," shall be met on exterior surfaces. For free release, values listed under both "Removable" and "Total" shall be met on all surfaces.

The portable Survey Station shall provide all-weather protection so that containers and equipment may be presented for survey in an environment free of snow, ice, water, and mud. The Survey Station shall provide workers shelter from the sun, wind, and rain, and provide provision to maintain radiological survey instrumentation between 4.5°C and 40.5°C during operations. All components within the structure shall be protected from freezing down to an ambient temperature of -24°C with a 6.7 m/s wind.

All materials and equipment shall be new, unused, suitable, and rated for the service intended.

The reliability and quality of components and systems provided shall be evaluated to ensure optimized operation. The operating philosophy shall be evaluated based on the ability to maintain the workers exposure to environmental, industrial, and radiological hazards as low as reasonably achievable (ALARA).

2.2 EQUIPMENT REQUIREMENTS

Structures or tents used for weather protection shall be designed in accordance with the American Society of Civil Engineers (ASCE) 7. Temporary structures or tents shall be capable of withstanding sustained wind speed of 31.4 m/s and 38.1 m/s peak gusts, exposure Category C, with importance factor 1.0, Seismic Zone 2B, with importance factor 1.25. Temporary structures or tents shall be designed for snow loading not less than 122 kg/m^2 in accordance with *Washington Administrative Code (*WAC) 296-150A-300.

Fabric structures shall consist of membrane installed over tubular steel frame members and tensioned both vertically and horizontally to prevent wear and abrasion. Vertical stretch shall be maintained mechanically with tension bars that require no ongoing maintenance.

The structure supplier shall provide all materials and methods to fully tension and seal the exterior fabric material around all doors, ventilation, and other required openings. Seals around openings shall present a neat and finished appearance and eliminate any loose materials that could be damaged by flapping or abrasion.

The membrane material shall be flame resistant polyvinyl chloride (PVC) coated polyester fabric with a minimum-coated weight of 680 g per square meter. The fabric shall be formulated to resist ultraviolet rays, moisture, cold cracking, and mildew. The material shall be selected from the manufacturer's standard colors for the side walls and be translucent white in the roof area.

Provide an identification sign that reads "SURVEY STATION" for each end of the structure. Lettering shall be clearly legible from a distance of 20 m.

Dry storage space for survey instruments and supplies shall be provided where surveying and decontamination activities occur.

Adequate ventilation shall be provided to prevent the accumulation of exhaust and fumes from container handling vehicles, earthwork equipment, and other equipment, as applicable. The ventilation system shall incorporate ductwork, which will draw engine exhaust out of the surveying station. The duct connection should be positioned

immediately above the location of the truck's exhaust stack where the truck stops in the station.

Work platforms shall be provided that allow access to all container/equipment surfaces for decontamination and radiological survey purposes. Heavy-duty slip resistant work platforms with railings and access stairs shall be provided, as shown on the Project Drawings. All equipment shall be Occupational Safety and Health Administration (OSHA) compliant.

SUBCONTRACTOR shall submit for approval and maintain on site records available for review at any time the following items:

- Manufacturer's descriptive literature (e.g., catalog cuts, material and/or component specification information, handling instructions, verification that materials provided comply with specification requirements)

- Shop drawings (layout and detailed, as applicable)

- Structural calculations stamped by a professional engineer registered in Washington State (as an equivalent, verification, including calculations, that manufactured components have been reviewed by a registered professional engineer and meet or exceed the design requirements stated in the Subcontract Document)

- Assembly/erection instructions

- Start-up plan and maintenance (including recommended spare parts list).

2.3 ELECTRICAL AND MECHANICAL REQUIREMENTS

Electrical and mechanical requirements shall be as specified in Technical Specification 0100N-SP-E0017, and as shown on the Project Drawings.

3.0 EXECUTION

3.1 FIELD OPERATIONS/SERVICES

Provide all materials, labor, and services required to construct, operate, and maintain the Survey Station. Upon completion of remediation activities, the station shall be disassembled and removed.

Survey Station operation shall be such that cross contamination of surrounding areas does not occur.

If a high efficiency particulate air (HEPA) vacuum is used (limited to 1 unit), SUBCONTRACTOR shall bag and weigh the collected waste. SUBCONTRACTOR shall document results and provide information to the CONTRACTOR. The bagged waste shall be delivered to the radiological control technician (RCT) for measurement of activity level. SUBCONTRACTOR shall then notify CONTRACTOR prior to disposal of bagged material into an Environmental Restoration Disposal Facility (ERDF) container.

3.2 ERECTION/INSTALLATION PROCEDURES

Installation and assembly procedures shall be in accordance with the manufacturer's instructions and recommendations. Equipment shall be installed in accordance with the manufacturer's instructions. A copy of the manufacturer's instructions shall be available for review at all times on the jobsite.

3.3 TESTING AND CERTIFICATION

Tests and inspections shall be performed by the SUBCONTRACTOR to establish that all installed systems operate properly and conform to the Subcontract Document. Completed documentation confirming test and inspection results shall be maintained on site and be available for review by the CONTRACTOR.

3.4 VERIFICATION OF COMPLIANCE

Prior to use of the Survey Station, submit written verification that the facility complies with the specifications contained in this section, has been tested to fully verify that it functions as intended, and that the on site records have been completed.

3.5 QUALITY ASSURANCE/QUALITY CONTROL

Establish and maintain an approved Quality Assurance/Quality Control (QA/QC) Program, in accordance with Exhibit "A," Quality Assurance Program, to assure compliance with Subcontract requirements and shall maintain records of QC for all operations. The program shall describe the system(s) for planning, performing, and assessing work that ensures materials, systems, results, and personnel meet stated quality, technical, and performance objectives. All activities related to surveying and decontamination shall conform to stated quality, technical, and performance objectives of the approved QA Program.

4.0 CLEAN-UP

All unused material and debris resulting from the work shall be removed following the completion of work. The work area shall be maintained daily in a clean and orderly fashion during construction activities.

5.0 YEAR 2000 WARRANTY

Any computer application or system or equipment provided under this specification shall be Year 2000 Compliant. As used in this warranty, the term "Year 2000 Compliant" means that the Product, when configured and used according to the documented instructions will without manual intervention or interruption:

a. Correctly handle and process date information before, during, and after January 1, 2000, accepting date input, proving date output and performing calculations, including, but not limited to, sorting and sequencing, on dates or portions of dates;

b. Function according to the documentation during and after January 1, 2000, without changes in operation resulting from the advent of the new century;

c. Where appropriate, respond to two-digit date input in a way that resolves any ambiguity as to century in a disclosed, defined, and predetermined manner;

d. Store and provide input of date information in ways that are unambiguous as to century; and

e. Manage the leap year occurring in the year 2000, following the quad-centennial rule. The "quad-centennial rule" means (a) if the year is divisible by 4, it is a leap year, UNLESS (b) the year is also divisible by 100, then it is not a leap year, UNLESS (c) the year is also divisible by 400, then it is a leap year.

Attachment 1: Appendix D to 10 CFR Part 835 - Surface Radioactivity Values (Standards for Release)

Nuclide Surface Radioactivity Values[1]: in dpm/100 cm^2	Removable [2,4]	Total (fixed + removable)[2,3]
U-nat, U-235, U-238, and associated decay products	1000	5000
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	20	500
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	200	1000
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.[5]	1000	5000
Tritium Organic Compounds; surface contaminated by HT, HTO, and metal tritide aerosols.	10,000	N/A

1 The values in the appendix apply to radioactive contamination deposited on, but not incorporated into the interior of, the contaminated item. Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- beta-gamma-emitting nuclides should apply independently.

2 As used by this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

3 The levels may be averaged over one square meter provided the maximum surface activity in any area of 100 cm^2 is less than three times the value specified. For purposes of averaging, any square meter surface shall be considered to be above the activity guide G if: (1) From measurements of a representative number n of sections it is determined that $1/n \bullet {}_nS_i \bullet G$, where S_i is the dpm/100 cm^2 determined from measurement of section I; or (2) it is determined that the sum of the activity of all isolated spots or particles in any 100 cm^2 area exceeds 3G.

4 The amount of removable radioactive material per 100 cm^2 of surface area should be determined by swiping the area with dry filter of soft absorbent paper, applying moderate pressure, and then assessing the amount of radioactive material on the swipe with an appropriate instrument of known efficiency. (Note -- The use of dry material may not be appropriate for tritium.) When removable contamination on objects of surface area less than 100 cm^2 is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped. Except for transuranics and Ra-228, Ac-227, Th-228, Th-230, Pa-231, and alpha emitters, it is not necessary to use swiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination levels are within the limits for removable contamination.

5 This category of radionuclides includes mixed fission products, including Sr-90 which is present in them. It does not apply to Sr-90, which has been separated from other mixed fission products or mixtures where the Sr-90 has been enriched.